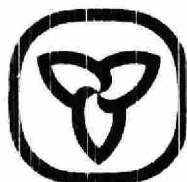


# AMBIENT AIR SURVEY IN THE NANTICOKE AREA, 1978

ARB - TDA Report No. 54-78

November 1978



Ontario

Ministry  
of the  
Environment

### Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at [copyright@ontario.ca](mailto:copyright@ontario.ca)

AIR RESOURCES BRANCH

Technology Development and Appraisal Section  
Monitoring and Instrumentation Development Unit

ARB-TDA Report No. 54-78

AMBIENT AIR SURVEY  
IN THE  
NANTICOKE AREA, 1978

Ontario Ministry of  
the Environment,  
880 Bay Street,  
Toronto, Ontario.

November, 1978

TD

883.7

N3

A4?

MOE

ALMV



## TABLE OF CONTENTS

	<u>Page</u>
01. SUMMARY	3
02. INTRODUCTION	6
03. SOURCE DESCRIPTION	7
04. SURVEY TECHNIQUE	9
05. MONITORING TECHNIQUE	11
06. MONITORING SITE LOCATIONS	12
07. RESULTS	17
08. DISCUSSION	19
09. APPENDIX	26

01. SUMMARY

The Atmospheric Environment Service (AES) of Canada coordinated and participated in extensive shoreline diffusion studies in the Nanticoke area during the last week of May and the first two weeks of June, 1978. This work was a component of Environment Canada's contribution to the Nanticoke Environmental Management Programme. The main aim of these studies was to determine the physical characteristics of boundary layer development with on-shore flows under warm atmospheric conditions and to investigate the types of dispersion and chemical interactions that plumes from coastal sources would be subjected to under these conditions.

The Ontario Ministry of the Environment (OME) and Ontario Hydro also participated in these ambient air research studies. The Monitoring and Instrumentation Development Unit of the Air Resources Branch (OME) provided ground-level measurements of selected gaseous pollutants. The major source under investigation was the Ontario Hydro Nanticoke Generating Station (NGS), located on the north shore of Lake Erie, approximately 55 km southwest of Hamilton, Ontario. The temporal and spatial history of the Thermal Induced Boundary Layer (TIBL) was investigated by no fewer than 11 separate research units and the ground level concentrations reported in this survey are a result of this cooperation.

Since establishment of the TIBL required a significant temperature difference between the air mass over the lake versus the air mass over the land, this atmospheric condition was not usually present until early afternoon. Thus, essentially all ambient air monitoring was carried out under clear atmospheric conditions and in the afternoons. These conditions were present on 5 days out of 14 monitoring days. Approximately 70 hours of

data were acquired from 34 different monitoring sites during these periods.

Since sulphur dioxide ( $\text{SO}_2$ ) was closely related to the quantity and quality of fossil fuel consumed by the NGS, it was the most important gaseous pollutant monitored. The overall average ground level concentration (glc) of  $\text{SO}_2$ , as recorded throughout all the monitoring periods, was 0.05 ppm with an associated standard deviation 0.06 ppm.

Only 4 hours of  $\text{SO}_2$  data, as acquired during 3 separate monitoring periods, resulted in 30-minute average glc's in excess of the Standard (0.3 ppm). The maximum 30-minute average concentration of  $\text{SO}_2$  was 0.5 ppm and this value was recorded on June 15th at a site 15 km downwind of the NGS. This site was probably in a fumigation zone and the plume originated from the NGS.

The oxides of nitrogen ( $\text{NO}_x$ ) was the next most important gaseous pollutant monitored during this survey. The overall average glc of  $\text{NO}_x$ , as recorded throughout all the monitoring periods, was 0.04 ppm with associated standard deviation 0.02 ppm. At no time was the  $\text{NO}_x$  Standard (expressed as  $\text{NO}_2$  concentrations) of 0.27 ppm exceeded. Since a very strong correlation coefficient ( $r = 0.99$  or greater) was found to exist between  $\text{SO}_2$  and  $\text{NO}_x$  ambient air concentrations and the wind-rose analyses were found to be similar, the source of  $\text{NO}_x$  was again inferred to be the Nanticoke Generating Station.

Low concentrations of hydrogen sulphide ( $\text{H}_2\text{S}$ ) were detected during this survey. With respect to all of the reported monitoring periods, the overall glc of  $\text{H}_2\text{S}$  was 0.009 ppm with associated standard deviation 0.006 ppm. As the standard deviation suggested, a uniform background concentration of  $\text{H}_2\text{S}$  was found in the Nanticoke area. Very little correlation was found between  $\text{H}_2\text{S}$  and  $\text{SO}_2$  concentrations. Long-range mass transport or seepage from local gas wells probably contributed to this gaseous pollutant. In addition, the

Nanticoke Generating Station was also found to be a possible source of  $H_2S$ , but its' absolute glc contribution was found to be insignificant.

Elevated concentrations of ozone ( $O_3$ ) were detected throughout this survey. With respect to all of the monitoring periods, the overall average glc of  $O_3$  was 0.05 ppm with associated standard deviation 0.02 ppm.

The  $O_3$  standard of 0.1 ppm was exceeded only during one day throughout this survey and the maximum 30-minute average ground level concentration of  $O_3$  was found to be 0.13 ppm. This elevated concentration was found to be essentially uniform, persistent and independent of monitoring site location. Correlation statistics between  $SO_2$ ,  $H_2S$  and THC (total hydrocarbons) versus  $O_3$  depicted no relationship nor discrete source(s) identification. Long-range mass transport from the southwest was the most probable source for this pollutant.

Throughout the survey, approximately 130 instantaneous samples of ambient air were analyzed for Peroxyacetyl Nitrate (PAN). These samples were taken during 7 different monitoring days and at 11 different monitoring sites. No PAN was detected.

## 02. INTRODUCTION

From May 29th through June 16th, 1978, an intensive shoreline diffusion study was conducted in the Nanticoke Area. This study was conducted and co-ordinated by the Nanticoke Environmental Management Programme and the Atmospheric Environment Service (AES) of Environment Canada.

The Ontario Ministry of the Environment was an integral member of this ambient air survey and the Monitoring and Instrumentation Development Unit of the Air Resources Branch provided ground-based, impingement measurements of selected gaseous pollutants.

Sulphur dioxide and the oxides of nitrogen were the gaseous pollutants of primary interest during this survey. The suspected source was the Nanticoke Generating Station (NGS) owned by Ontario Hydro and located on the north shore of Lake Erie, approximately 55 km southwest of Hamilton, Ontario. Since the routine monitoring programme implemented by the Mobile Air Monitoring (MAM) unit included measurements of other gaseous pollutants and a variety of ground-based meteorological parameters, these data were also accumulated.

The study was of a comprehensive nature. No fewer than eleven separate investigative research units were employed during this period.

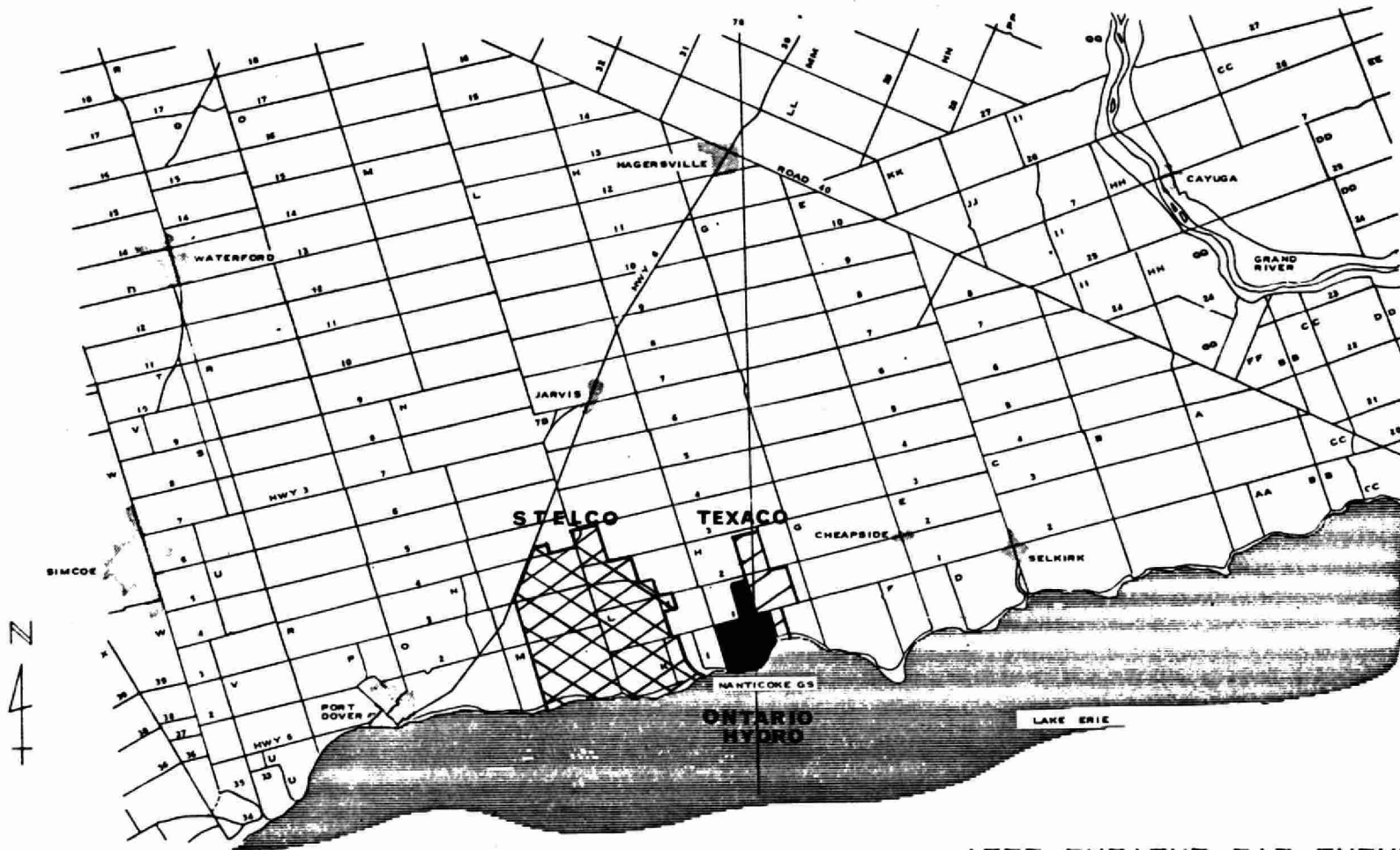
Although the Texaco and Stelco industrial complexes were also located in the survey area, their status was either under construction or initial "burn-on". Very little gaseous emissions originated from either of these sources.

Owing to the cooperation and co-ordination of the research units, the data presented in this report depicted mainly the gaseous emissions originating from the Nanticoke Generating Station. Plume tracking, dispersion and fumigation were the main aims of this study.

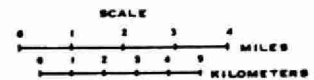
03. SOURCE DESCRIPTION

The Ontario Hydro, Nanticoke Electric Generating Station is located approximately 55 km southwest of Hamilton on the north shore of Long Point Bay (Lake Erie). This station is fossil fuelled and, at this time, was operating at approximately 33% of its maximum capacity of 4000 MW.

This plant and the surrounding industrial complexes are shown in Map #1, page 8.



N  
4  
+



# 1978 AMBIENT AIR SURVEY SOURCE LOCATION

NANTICOKE GS - AIR POLLUTION SURVEY AREA

04. SURVEY TECHNIQUE

Analytical instrumentation housed in a 1975 General Motors Corporation Transmode was utilized to monitor the gaseous emissions from the NGS. This unit was equipped with an automated data acquisition system (Hewlett & Packard 9830A mini-computer) and on-board electric generators for fully automated, independent and continuous monitoring capabilities. The HP 9830A mini-computer performed initial data analyses in the field (re: accuracy and validity) whereas the final data reduction and analyses were carried out by a larger computer system located within the Air Resources Branch at 880 Bay Street, Toronto.

This mobile air monitoring (MAM) unit had permanently installed analyzers for monitoring sulphur dioxide, hydrogen sulphide, oxides of nitrogen, total hydrocarbons, methane and carbon monoxide. Meteorological instrumentation for monitoring wind speed, wind direction, relative humidity, temperature, barometric pressure and solar radiation was also included in this instrumentation package. A G.C./ECD unit was set up for monitoring of peroxyacetyl nitrate (PAN) and was used extensively throughout this survey. See Table #1, page 10, for listing of the above.

Through cooperation with the other research monitoring units associated with this study, approximate locations of maximum ground level concentration (glc) impingement zones were found and ambient air monitoring was initiated. Air quality was continuously monitored for at least 45 minutes at each location and, whenever possible, farther downwind monitoring was undertaken.



TABLE #1

INSTRUMENTATION - GMC

Instrument	Manufacturer	Analytical Technique	Maximum Sensitivity (Full Scale)
H <sub>2</sub> S Source	Hartmann & Braun (H&B Prüfgasgenerator)	N/A	N/A
H <sub>2</sub> S Analyzer	H&B Picos	electrochemical	0.05 ppm
SO <sub>2</sub> Source	H&B Prüfgasgenerator	N/A	N/A
SO <sub>2</sub> Analyzer	H&B Picoflux 2	conductometric	0.3 ppm
O <sub>3</sub> Analyzer/Source	Bendix 8002	chemiluminescent	0.05 ppm
NO <sub>x</sub> , NO <sub>2</sub> , NO Analyzer	Bendix 8101-B	chemiluminescent	0.5 ppm
CO Analyzer	H&B Uras 2T	Infrared Absorption	50 ppm
THC, CH <sub>4</sub> , THC-CH <sub>4</sub> Analyzer	Ingenieur - Produktions-Gruppe München (IPM) RS-5	Dual flame ionization detector	50 ppm THC (as CH <sub>4</sub> )
Hg Analyzer	Scintrex HGP-2	Ultra-violet Absorption	200 ng/m <sup>3</sup>
CO, THC, THC-CH <sub>4</sub> , CH <sub>4</sub> source	Matheson	compressed gas	N/A
Hydrocarbons chlorinated hydrocarbons, PAN, etc. Analyzer	Hewlett & Packard Gas Chromatograph 5830A System	Retention time as measured by electron capture, thermal conductivity, or flame ionization detectors	As set by calibration procedure.

Instrument	Manufacturer	Scale
Wind Speed	Lambrecht gmbH	km/hr
Wind Direction	Lambrecht gmbH	degrees
Temperature	Weather Measure (WM) T621	°C
Relative Humidity	WM-HM-111P	percentage
Barometric Pressure	WM-BM70-B242	millibars
Solar Radiation	WM Star Pyranometer	watts/cm <sup>2</sup>

05. MONITORING TECHNIQUE

Sample Collection -

The ambient air sample was taken at a constant flow rate (approximately 0.2 cubic metres/min) by a probe located on top of the MAM unit and whose orifice was approximately 5 metres above ground level. The air sample entered a manifold where each analyzer was parallel tapped with a minimal length of teflon sampling line. This arrangement ensured little or no sample degradation, minimal delay time and minimal sample contamination due to ground level sources (e.g., entrained soil, vehicular traffic, etc.).

Meteorological Analyses -

Meteorological conditions were monitored on a continuous basis by the instrumentation associated with the Transmode MAM unit.

In addition, a very extensive meteorological monitoring network was operated and maintained by the Atmospheric Environment Service. This additional information relating to micro and macroscale phenomena was found to be very useful in data interpretation.

Calibration -

Analyzers and sources were calibrated before the survey. During the survey, the analyzers' calibration was checked at least once every day using the sources and built-in electronic circuitry. All monitors were found to be extremely stable and the calibration remained within the prescribed limits throughout the duration of the survey. Immediately following completion of this survey, all instruments were rechecked in the laboratory and all calibration statistics were found to be satisfactory.

06. MONITORING SITE LOCATIONS

The ambient air monitoring sites are shown on Map #2, page 13, and their associated descriptions are presented in Table #2, pages 14 and 15. Over 68 hours of data were accumulated at these 34 reported monitoring sites.

The sites are presented in chronological order; however, omissions were made as noted by the numbering scheme. The omissions were based on the following:

- i) insufficient data - 45 minutes was deemed the minimal observational period in order to establish a "true" 30-minute average concentration of the gaseous pollutant of interest.
- ii) instrument failure - mainly data acquisition and data handling - cassette tape damage.
- iii) calibration statistics - several monitoring periods included only this type of data.
- iv) gas chromatograph - meteorological data - several monitoring periods included only this type of data.

With respect to the gas chromatograph analyses, the monitoring sites are described in Table #3, page 16.

All monitoring sites were referenced to the main stacks of the Nanticoke Generating Station - U.T.M. co-ordinates 05780 - 47386.

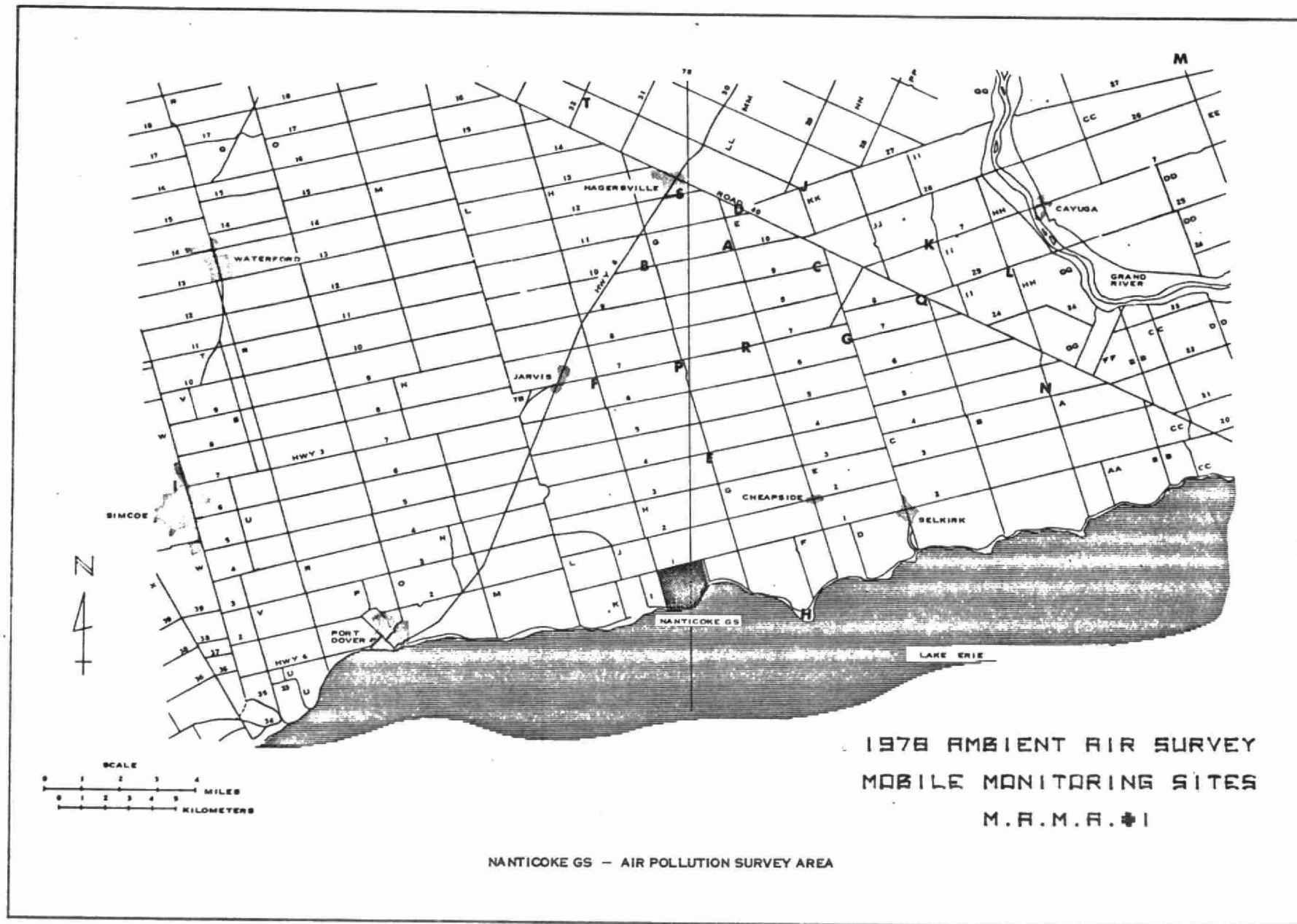


TABLE #2

MOBILE AIR MONITORING SITES

NANTICOKE III SURVEY - 1978

SITE	MAP I.D.	UTM COORDINATES, LOCATION	DISTANCE (km)	BEARING (DGS)	DATE/1978
2	A	Cheapside Rd. & Con.#10 (05800-47540)	14.5	015	May 29th
3	B	Con.#10, 0.5 km E. Sandusk Rd. (05760-47532)	14.5	000	May 29th
4	C	Con.#9, 0.5 km W. Selkirk Rd. (05848-47527)	15.0	030	May 29th
6	D	Hwy.40, 0.2 km NW Corner Con.#11 (05802-47555)	16.0	010	May 30th
7	C	Hwy.3 & Selkirk Rd. (05847-47516)	12.5	030	May 30th
8	D	Nelle's Corners (Hwy.3 & 40) (05855-47530)	16.0	030	May 31st
9	E	Bridge at Con.#4 & Sandusk Rd. (05789-47449)	6.5	010	June 1st
10	F	Hwy.3 & Nanticoke Rd. (05740-47484)	10.0	340	June 1st
11	G	Selkirk Rd. between Con.# 6 & 7 (05852-47500)	13.5	030	June 1st
12	H	Lakeshore & Cheapside Rd. (05840-47395)	6.0	080	June 2nd
14	F	Hwy.3 & Nanticoke Rd. (05740-47430)	10.0	340	June 3rd
15	I	Minden Manor Motor Inn (05557-47430)	19.0	300	June 3rd
16	F	Nanticoke Rd., 100 m S. of Hwy.3 (05742-47484)	10.0	340	June 4th
17	D	Hwy.40 & Cheapside Rd. (05795-47558)	17.0	010	June 4th
18	D	Hwy.40, 0.1 km S. of Cheapside Rd. (05798 47555)	16.0	010	June 4th
19	J	Hwy.27, 0.5 km E. of Hwy. #29 (05835-47567)	23.5	020	June 4th
20	H	Peacock Point (05830-47381)	5.4	100	June 5th

TABLE #2 (Cont'd)

NANTICOKE SURVEY III (Continued)

SITE	MAP I.D.	UTM COORDINATES, LOCATION	DISTANCE (km)	BEARING (DGS)	DATE/1978
21	K	Hwy.#3, 5 km E. of Hwy.40 (05883-47540)	20.0	045	June 6th
22	K	" " "	20.0	045	June 6th
23	G	Selkirk Rd., 0.2 km N. of Walpole Con.#6 (05851- 47501)	14.0	030	June 6th
24	L	Rainham Con.#8 & Reg Rd. #8 (05920-47530)	20.0	045	June 12th
25	M	Hwy.#56, 5 km N. of Hwy.#3 (05993-47615)	31.0	045	June 12th
26	N	Reg Rd. #8, 0.5 km N. of Con.#3 (05935-47477)	17.5	060	June 12th
27	P	Hwy.#3 & Sandusk Rd. (05779-47493)	10.0	000	June 13th
30	P	Hwy.#3 & Sandusk Rd. (05779-47493)	10.0	000	June 13th
32	H	Peacock Pt. & Dead End Rd. (05830-47379)	5.0	100	June 14th
36	Q	Hwy.40, 0.2 km N. Fisher- ville Rd. (05880-47517)	15.0	045	June 15th
37	Q	" " "	15.0	045	June 15th
38	M	Hwy.56 & Seneca Con.#2 Chem Lab (05991-47621)	31.0	045	June 15th
39	F	Hwy.3 & Nanticoke Rd. (05740-47484)	10.0	340	June 16th
40	R	Hwy.3, 1 km W. of Cheap- side Rd. (05805-47498)	11.0	015	June 16th
41	S	Hagersville Water Tower (05774-47564)	18.0	000	June 16th
42	T	Hwy.32 & Con.#2 (05736-47608)	22.0	350	June 16th
43	S	Hwy.40, 1 km SE of Hagers- ville (05782-47565)	17.5	000	June 16th

TABLE #3

NANTICOKE (PAN) SURVEY SUMMARY

DATE	# OF RUNS	TIME RUN	MONITORING PERIOD AND LOCATION
May 30/78	11	12:20→15:05	#6 - Hwy #40, 0.2 Km. N.W. of Con. #11
	10	15:45→19:15	#7 - Hwy #3 & Selkirk Rd.
May 31/78	3	10:55→11:35	#8 - Nelles Corners (Hwy #3 & #40)
	5	14:35→15:45	#9 - Bridge at Con.#4 & Sandusk Rd. (Nr. Sandusk Rd.)
June 1/78	7	9:36→11:15	#9 - Con. #4 & Sandusk Rd. (Nr. Sandusk Rd.)
	5	11:45→12:55	#10 - Hwy #3 & Nanticoke Rd.
	6	13:20→14:45	#10 - Hwy #3 & Nanticoke Rd.
	7	15:10→16:40	#11 - Selkirk Rd. Between Concessions 6 & 7
June 2/78	15	10:55→14:25	#12 - Lakeshore & Cheapside Rd.
	3	14:45→15:25	#12 - Lakeshore & Cheapside Rd.
June 3/78	19	10:50→15:40	#14 - Hwy #3 & Nanticoke Rd.
June 5/78	12	12:10→15:10	#20 - Peacock Pt.
June 6/78	17	11:30→15:30	#21 - Hwy #3, 5 Km. E. of Hwy #40
	13	15:55→19:00	#23 - Selkirk Rd., 0.2 Km. N. of Walpole Con. #6

07. RESULTS

Definition of Terms -

Scan Time: Time interval for averaging and data logging of instantaneous interrogations by the data acquisition system of the monitoring instruments.

Time: Time of first and final scans used to determine running averages.

Number of Readings: Number of scans.

MAM: Mobile Air Monitoring

MAC: Maximum Average Concentration

glc: ground level concentration

All statistical values are based on accumulative averages of continuous instantaneous interrogations of the analytical instruments and all results are expressed in parts per million (ppm). An example of the processed data format incorporated in this survey report is presented in Table #4, page 18. Due to the voluminous nature of these data, an addendum entitled, "Ambient Air Survey in the Nanticoke Area - 1978; Compilation of Time Averaged Data", will accompany this report and will be presented upon request.

The statistical summary of the collected data is presented in Tables #5 and #6, pages 55 through 60. Supplementing these tables, concentration versus time graphs for  $H_2S$ ,  $SO_2$  and  $NO_x$  are presented in Figures #1 to #13, pages 28 to 40.

In order to identify source locations, wind-rose/concentration analyses were also performed (reference to Maps #3 to #6, pages 51 through 54).

Correlation statistics of sulphur dioxide versus oxides of nitrogen and hydrogen sulphide are also presented (Figures #14 to #23, pages 41 through 50) in order to ascertain source identification.



TABLE #4

Processed Data Format

Nanticoke III #4

(Further Analyses are Presented as an Addendum)

NANTICOKE III #4

DATE: MAY 29 1978  
 SCAN TIME: 90 SEC  
 AVERAGING TIME: 30 MIN  
 LOCATION: CONC #9, 0.5KM W SELKIRK RD. (05848-47527); 15KM & 030DGS/SRC

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 OZONE WIND SPEED	THC NOX SOLAR RAD WIND DIRECTION	SO2 NO2 TEMP
17:49----18:19	9.0E+00 2.9E-01 7.7E-03 986	3.2E-03 7.1E-01 7.6E-02 13	8.2E-01 2.0E-02 3.9E-02 206	2.7E-02 1.6E-02 39
17:52----18:22	7.8E+00 2.9E-01 7.3E-03 986	3.3E-03 7.1E-01 7.7E-02 12	8.2E-01 1.7E-02 3.8E-02 203	2.1E-02 1.3E-02 39
17:55----18:25	7.3E+00 3.0E-01 7.2E-03 986	3.2E-03 7.1E-01 7.8E-02 12	8.3E-01 1.6E-02 3.7E-02 203	1.8E-02 1.2E-02 39
17:58----18:28	6.9E+00 3.0E-01 7.1E-03 986	3.2E-03 7.1E-01 7.8E-02 12	8.3E-01 1.6E-02 3.6E-02 203	1.6E-02 1.1E-02 39

STATISTICS

NUMBER OF READINGS 26

POLLUTANT	MINIMUM VALUE	MAXIMUM VALUE	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STD. DEV.
CO	6.02E+00	1.97E+01	8.33E+00	3.28E+00	7.91E+00	1.36E+00
H2S	2.01E-03	4.37E-03	3.39E-03	6.65E-04	3.32E-03	1.23E+00
THC	7.89E-01	8.67E-01	8.23E-01	1.77E-02	8.23E-01	1.02E+00
SO2	1.33E-02	9.38E-02	2.44E-02	1.94E-02	2.04E-02	1.71E+00
THC-CH4	2.76E-01	3.06E-01	2.95E-01	7.73E-03	2.95E-01	1.03E+00
CH4	6.96E-01	7.30E-01	7.10E-01	8.85E-03	7.10E-01	1.01E+00
NOX	1.44E-02	4.34E-02	1.89E-02	7.17E-03	1.80E-02	1.33E+00
NO2	8.49E-03	4.26E-02	1.47E-02	8.29E-03	1.34E-02	1.49E+00
NO	6.35E-03	1.08E-02	7.49E-03	1.07E-03	7.42E-03	1.14E+00
OZONE	6.29E-02	8.07E-02	7.64E-02	3.60E-03	7.64E-02	1.05E+00
SOLAR RAD	3.16E-02	4.29E-02	3.72E-02	3.44E-03	3.70E-02	1.10E+00
TEMP	37	40	39	1		
BAROMETER	986	987	986	0	986	1
WIND SPEED	9	18	12	2	12	1

08. DISCUSSION

Ambient air monitoring of ground-level concentrations (glc) of gaseous pollutants by the aforementioned MAM unit was carried out during 14 days in the time period May 29th to June 16th, 1978. During this time, approximately 70 hours of data were collected at 34 different monitoring sites.

Ground level concentration measurements of gaseous pollutants, within fumigation zones as defined below, were the main aims of this study. When the air over the land was significantly warmer than that over the lake, the stable lake air horizontally advected over the land surface and quickly became modified. A mixing layer (called Thermal Internal Boundary Layer - TIBL) between the cool lake air and the warmer land air was produced. Elevated coastal plumes (an example being the stack emissions from the NGS) travelled inland with very little dispersion in the cooler stable flow aloft until they reached the edge of the TIBL. At this point, the convective turbulences of the underlying unstable air fumigated the plumes producing high glc's.

Although several weather systems moved through this locale during this time, all ambient air monitoring was essentially performed under clear skies. The terrain was essentially flat and void of any large geographical structures. As a result of the small orographic interaction and the clear weather conditions, the TIBL was often found to be well defined during the afternoons and discrete fumigation zones often resulted.

It should be stated that all concentrations reported may be directly attributed to the emissions originating from the Nanticoke Generating Station (NGS) owned by Ontario Hydro. The collective plume dispersion research involved during this survey was extensive and left very little doubt as to source identification.

The positions of these fumigation zones were first determined by the other research units associated with this study and this information was then relayed to the MAM unit. Monitoring at these zones was initiated as soon as possible. Because of this time delay, several monitoring periods did not report maximum glc's, but rather detected a decrease in concentrations as time evolved (reference to monitoring periods #3, 4, 7, 10, 17, 23 and 27).

The following Standards, based on a 30-minute average concentration of gaseous pollutants, as set out in Schedule 1, Regulation 15 of the Ontario Environmental Protection Act, will be discussed/compared in the ensuing discussion.

<u>Pollutant</u>	<u>Standard</u> *
SO <sub>2</sub>	0.30 parts per million (ppm)
H <sub>2</sub> S	0.02 ppm **
NO <sub>x</sub>	0.27 ppm ***
O <sub>3</sub>	0.10 ppm

\* Conversion from ug/m<sup>3</sup> to ppm was made under the following conditions; temperature: 298°K (25°C) and atmospheric pressure 101.6 kPa.

\*\* This instrument was also sensitive to other reduced sulphur compounds. However, as dictated by the source emissions, H<sub>2</sub>S was assumed to be the major gaseous component and the results were reported accordingly.

\*\*\* Expressed as concentrations of NO<sub>2</sub>.

#### Sulphur Dioxide - SO<sub>2</sub>

Of the gaseous pollutants monitored during this survey, SO<sub>2</sub> was the most important. It was closely related to the quantity and quality of fossil fuel consumed by the Nanticoke Generating Station.

For all of the reported monitoring periods, the overall average concentration of SO<sub>2</sub> was 0.05 ppm with associated standard deviation 0.06 ppm.

A summary of the statistical results for this gaseous pollutant is presented in Table #5, pages 55 to 57. The maximum instantaneous glc of  $\text{SO}_2$  was 0.99 ppm and this value was recorded during monitoring period #23 on June 6th. (See following discussion for more details regarding this monitoring period.)

The 30-minute Standard was exceeded on three separate occasions. (Four of the reported 68 hours of data.)

The largest maximum 30-minute average glc of  $\text{SO}_2$  was 0.5 ppm and this level was detected during monitoring period #37 on June 15th. The MAM unit was located approximately 15 km downwind of the NGS and the winds were approximately 15 km/hr from the southwest. The wind-rose for this monitoring period (Map #5, page 53) clearly showed the NGS as being the only possible source. Due to the time delay between ascertaining this fumigation zone and initiating monitoring, it was felt that the ambient air concentrations of  $\text{SO}_2$  were even greater than those reported/detected. In support of this statement, the concentration/time graph (Figure #10, page 37) showed a gradual decrease in concentration with time.

The other two monitoring periods that depicted  $\text{SO}_2$  concentrations in excess of the Standard were #10 and #23. Period #10 was very similar to #37 with respect to concentration versus time evolution. However, monitoring period #23 gave results indicative of the total fumigation process. The maximum 30-minute average glc was 0.4 ppm and this value was recorded at 1700 hrs LST. The concentration/time graph (Figure #8, page 35) showed the gradual buildup/dissipation of ground-level concentrations of  $\text{SO}_2$  at this site. The wind-rose for this period (Map #4, page 52) also pointed to the NGS as being the only possible source for this pollutant.

At all other monitoring sites, the maximum 30-minute average ground level concentrations of  $\text{SO}_2$  were less than the Standard. Complete plume fumigation histories were depicted during monitoring periods #2, 6, 12, 22 and 25. The concentration/time graphs representative of these periods are presented in Figures #1, 2, 5, 7 and 9.

#### Oxides of Nitrogen - $\text{NO}_x$

The second most important gaseous pollutant detected during this survey was oxides of nitrogen. It was indicative of combustion efficiency and operating temperatures within the NGS.

For all of the reported monitoring periods, the overall average concentration of  $\text{NO}_x$  at the points of impingement was 0.037 ppm with associated standard deviation 0.022 ppm. The statistical summary for the ambient air concentrations of this pollutant is presented in Table #6, pages 58 through 60.

At no time during this survey was the Ontario Standard for  $\text{NO}_x$  exceeded. (Albeit five of the 34 monitoring periods depicted instantaneous concentrations of  $\text{NO}_x$  in excess of 0.27 ppm with the largest being 0.48 ppm.)

The largest maximum 30-minute average glc of  $\text{NO}_x$  was detected during monitoring period #37 on June 15th and its reported value was 0.24 ppm. The winds were from the southwest at approximately 15 km/hr and the MAM unit was located on Highway #40 near Fisherville Road, approximately 15 km downwind of the NGS. (See  $\text{SO}_2$  discussion for source identification.)

A very strong positive correlation existed for  $\text{NO}_x$  and  $\text{SO}_2$  concentrations. This correlation persisted throughout the

survey and the coefficient was found to be approximately 0.99. Thus, an identical source(s) was inferred from this information. (See correlation plots Figures #14, 15, 16 and 17 as reported for monitoring periods #6, 10, 37 and 41.) Thus, the NGS was the most probable source of this gaseous pollutant.

#### Hydrogen Sulphide -

For all of the reported monitoring periods, the overall average glc of  $H_2S$  was 0.009 ppm with associated standard deviation 0.006 ppm. The statistical summary for this gaseous pollutant is presented in Table #5, pages 55 to 57.

Essentially low concentrations of  $H_2S$  were found throughout this survey. Very little, if any, correlation between  $SO_2$  and  $H_2S$  concentrations was found. (See Figures #18 and 19 on pages 45&46.) This fact suggested that rather than the NGS being the most probable source, seepage from local gas wells and/or long-range mass transport from the W, SW were the more logical sources for this pollutant at these relatively low concentrations.

The Standard was exceeded during 4 separate monitoring periods (#'s 9, 15, 21 and 25). However, only monitoring periods #21 and #25 depicted true ambient air concentrations of  $H_2S$ , whereas #9 and #15 depicted the lag-time response of the analytical instrument as is often present at the end of calibrations. (A minimum of 30 minutes must separate calibration and monitoring periods so as to ensure stabilization of sensors.)

The largest maximum 30-minute average glc of  $H_2S$  was 0.029 ppm and this value was recorded during monitoring period #25. As the concentration/time graph (Figure #9 , page 36) denoted possible fumigation at this monitoring site on June 12th (viz.  $SO_2$  and  $NO_x$  concentrations), it may be assumed that a percentage of the  $H_2S$

originated from the NGS. Unfortunately, no meteorological data was recorded by the MAM unit at this time. However, a secondary information source (AES) stated the winds were brisk ( $\sim 25$  km/hr) from the SW. During this monitoring period, the overall average glc of  $H_2S$  was found to be 0.021 ppm with standard deviation 0.007 ppm. Since the background concentration of  $H_2S$  was essentially 0.009 ppm with standard deviation 0.006 ppm, it therefore may be assumed that the emissions from the NGS contained some  $H_2S$  but the contribution to ground-level concentrations may be considered insignificant.

#### Ozone - $O_3$

For the entire survey, all reported concentrations of  $O_3$  depicted relatively high values. For this survey, the overall average glc of  $O_3$  was 0.047 ppm (a concentration approximating 1/2 of the 30-minute Standard) with associated standard deviation 0.023 ppm. As indicated by the standard deviation, this elevated concentration was found to be essentially uniform, persistent and independent of monitoring site. This fact strongly suggested that the NGS was not a major source for this pollutant and that the most probable source was assumed to be long-range mass transport from the southwest. (For statistical analyses, see summary Table #6, pages 58 to 60.

Throughout the entire survey, the Standard was exceeded only during one monitoring day (May 30th) and the  $O_3$  concentrations were recorded during monitoring periods #6 and #7. Although these monitoring sites were separated by 3.5 km, the maximum 30-minute average glc's of  $O_3$  were essentially the same - i.e., 0.12 ppm. Since correlation statistics between  $SO_2$ , THC (total hydrocarbons) and  $H_2S$  versus  $O_3$  depicted no causal relationship (see Figures 21,



22 and 23 on pages 48 to 50) ,no positive source(s) identification could be made. The Nanticoke area was in the warm sector of a low pressure area centered over eastern Lake Superior and the winds were brisk and southwesterly. Hence the assumption of long-range mass transport of  $O_3$  was deemed reasonable.

The highest 30-minute average glc of  $O_3$  was 0.13 ppm as reported during monitoring period #7. (See concentration/time graph, in Figure #13, page 40.)

$NO_x$  acts as a "sink" for  $O_3$  and this relationship was shown by the strong negative correlation statistics between these two pollutants. ( $r = 0.88$  for monitoring period #6 as shown in Figure #20 on page 47.) Because of this phenomenon and the presence of possible fumigation at the monitoring site, monitoring period #6 may have had higher concentrations of  $O_3$  than those reported during monitoring period #7. The concentration/time analysis for  $O_3$  as reported during period #6 is presented in Figure #11 on page 38.

#### Peroxyacetyl Nitrates - PAN

Approximately 130 instantaneous samples of ambient air were analyzed for PAN concentrations. The samples were analyzed by a gas chromatograph associated with the MAM unit and the sampling itinerary is presented in Table #4, page 18. These samples were taken during 7 different monitoring days and during 11 different monitoring periods.

No PAN was detected in the Nanticoke area during this survey.



09. APPENDIX

A. Concentration/Time Graphs:

Monitoring period #2 - SO <sub>2</sub> , H <sub>2</sub> S and NO <sub>x</sub>	-	Figure #1
" " #6 - " " "	-	Figure #2
" " #9 - " " "	-	Figure #3
" " #10 - " " "	-	Figure #4
" " #12 - " " "	-	Figure #5
" " #21 - " " "	-	Figure #6
" " #22 - " " "	-	Figure #7
" " #23 - " " "	-	Figure #8
" " #25 - " " "	-	Figure #9
" " #37 - " " "	-	Figure #10
" " #6 - SO <sub>2</sub> , H <sub>2</sub> S and O <sub>3</sub>	-	Figure #11
" " #6 - SO <sub>2</sub> , NO <sub>x</sub> and O <sub>3</sub>	-	Figure #12
" " #7 - SO <sub>2</sub> , H <sub>2</sub> S and O <sub>3</sub>	-	Figure #13

B. Correlation Statistics - Graphs:

Monitoring period #6 - NO <sub>x</sub> versus SO <sub>2</sub>	-	Figure #14
" " #10 - " " "	-	Figure #15
" " #37 - " " "	-	Figure #16
" " #41 - " " "	-	Figure #17
" " #10 - H <sub>2</sub> S versus SO <sub>2</sub>	-	Figure #18
" " #25 - " " "	-	Figure #19
" " #6 - NO <sub>x</sub> versus O <sub>3</sub>	-	Figure #20
" " #6 - THC versus O <sub>3</sub>	-	Figure #21
" " #6 - H <sub>2</sub> S versus O <sub>3</sub>	-	Figure #22
" " #6 - SO <sub>2</sub> versus O <sub>3</sub>	-	Figure #23

C. Wind-Roses:

Monitoring period #6 - SO <sub>2</sub> and wind dir.	-	Map #3
" " #23 - " " " "	-	Map #4

C. Wind-Roses (Cont'd):

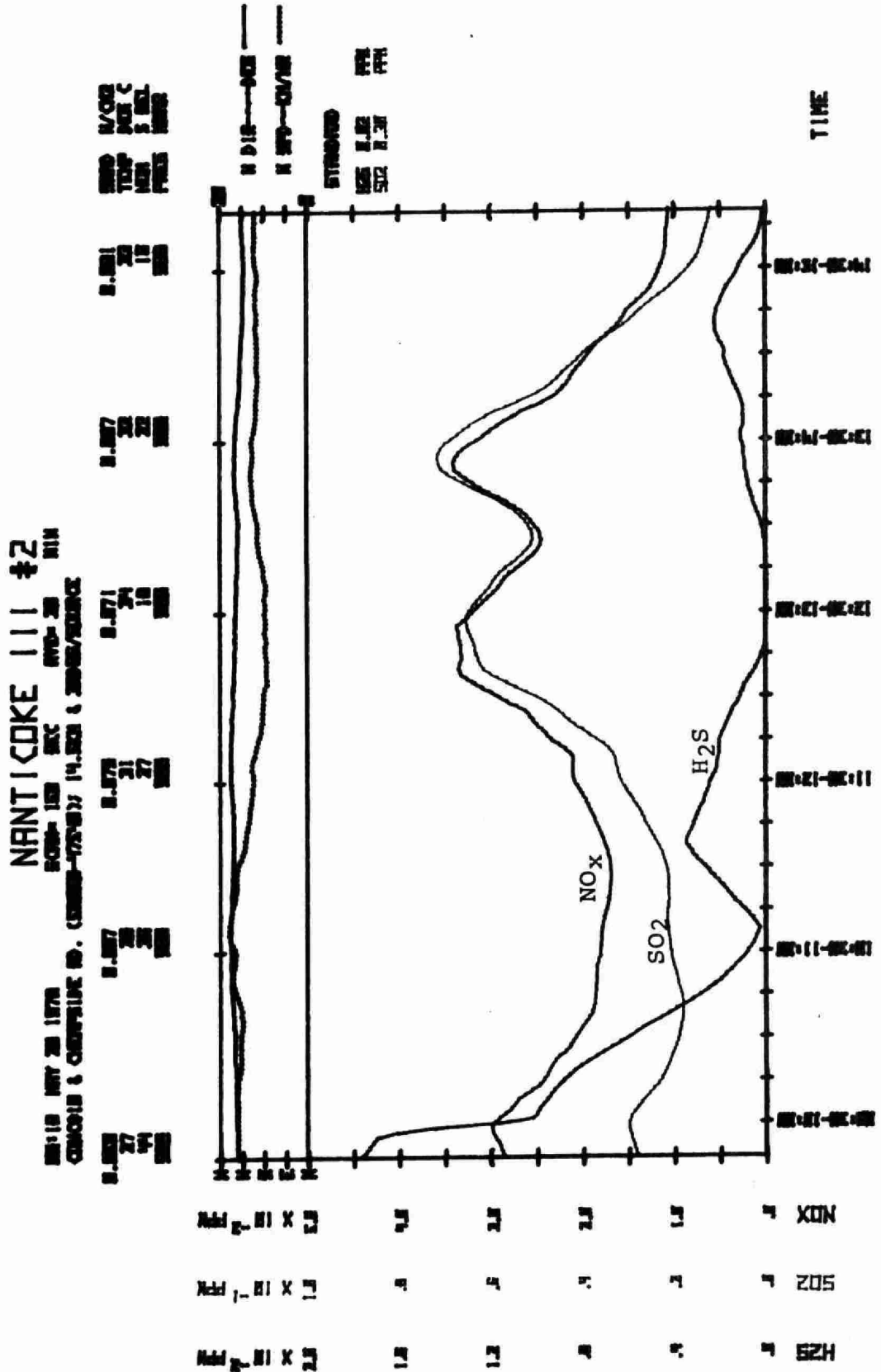
Monitoring period #37 - SO<sub>2</sub> and wind dir. - Map #5  
" " #41 - " " " " - Map #6

D. Statistical Summary Tables:

SO<sub>2</sub> and H<sub>2</sub>S concentrations - Tables #5a, 5b, 5c

O<sub>3</sub> and NO<sub>x</sub> concentrations - Tables #6a, 6b, 6c

FIGURE #1







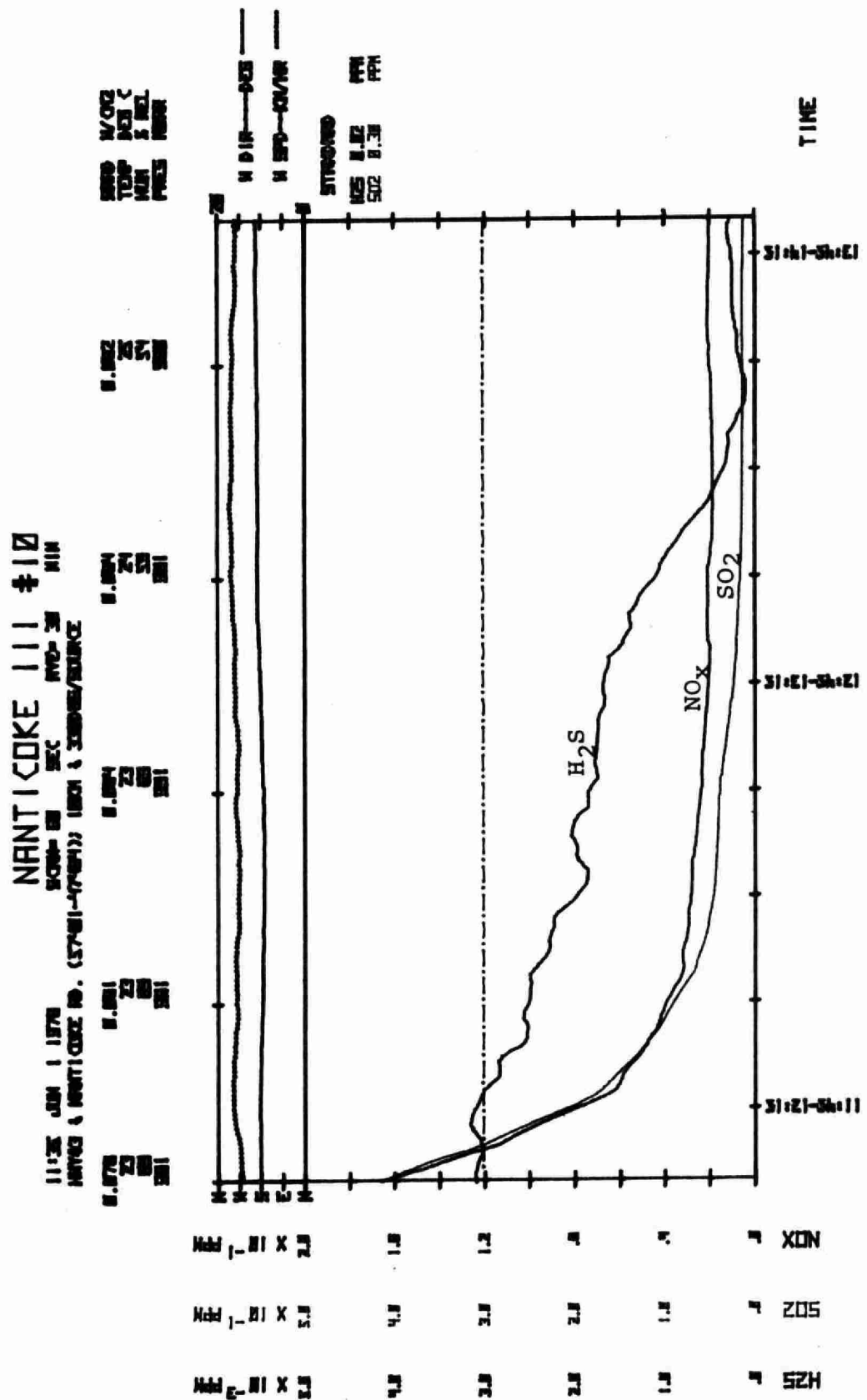


FIGURE #5

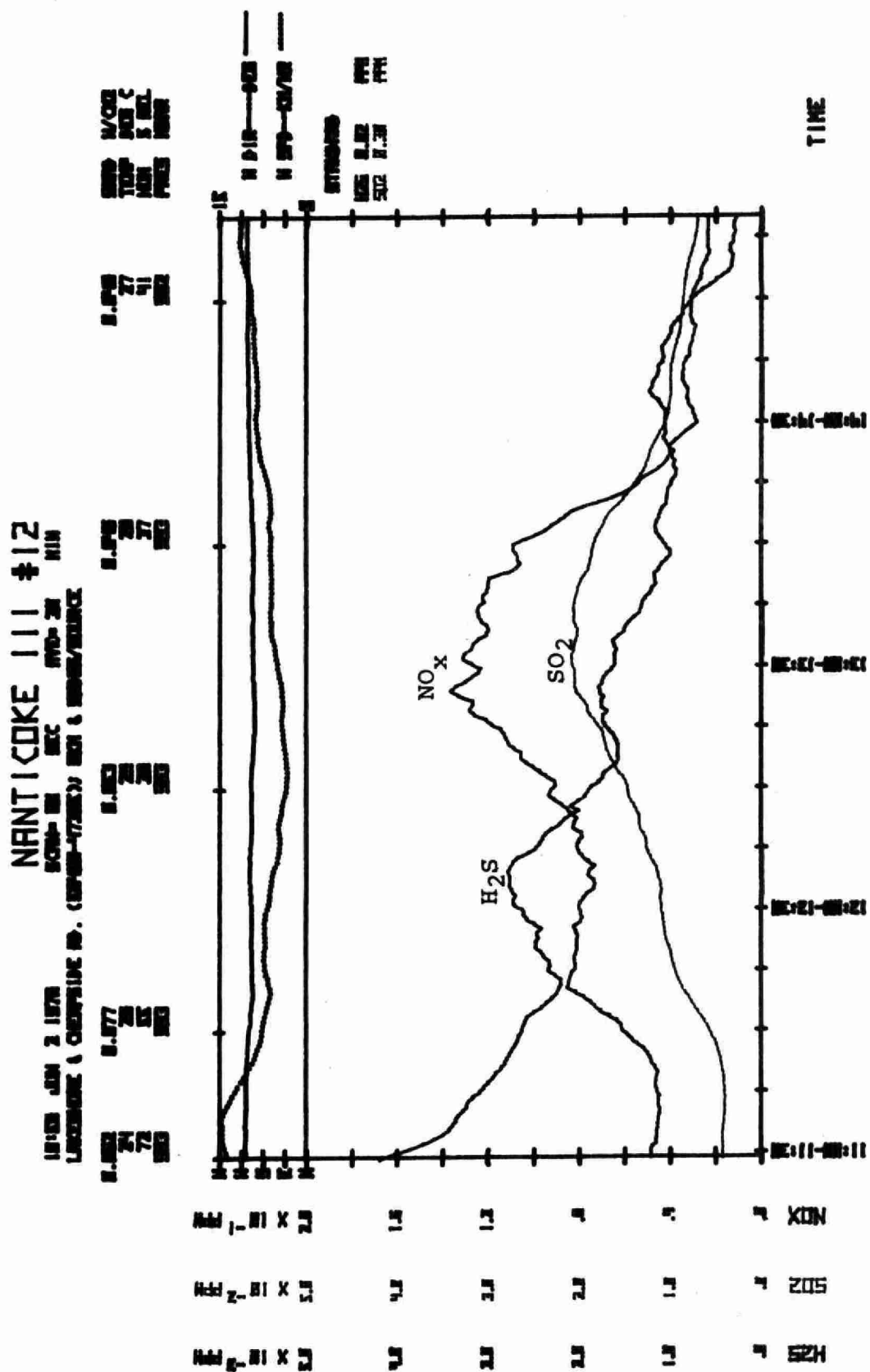






FIGURE #7

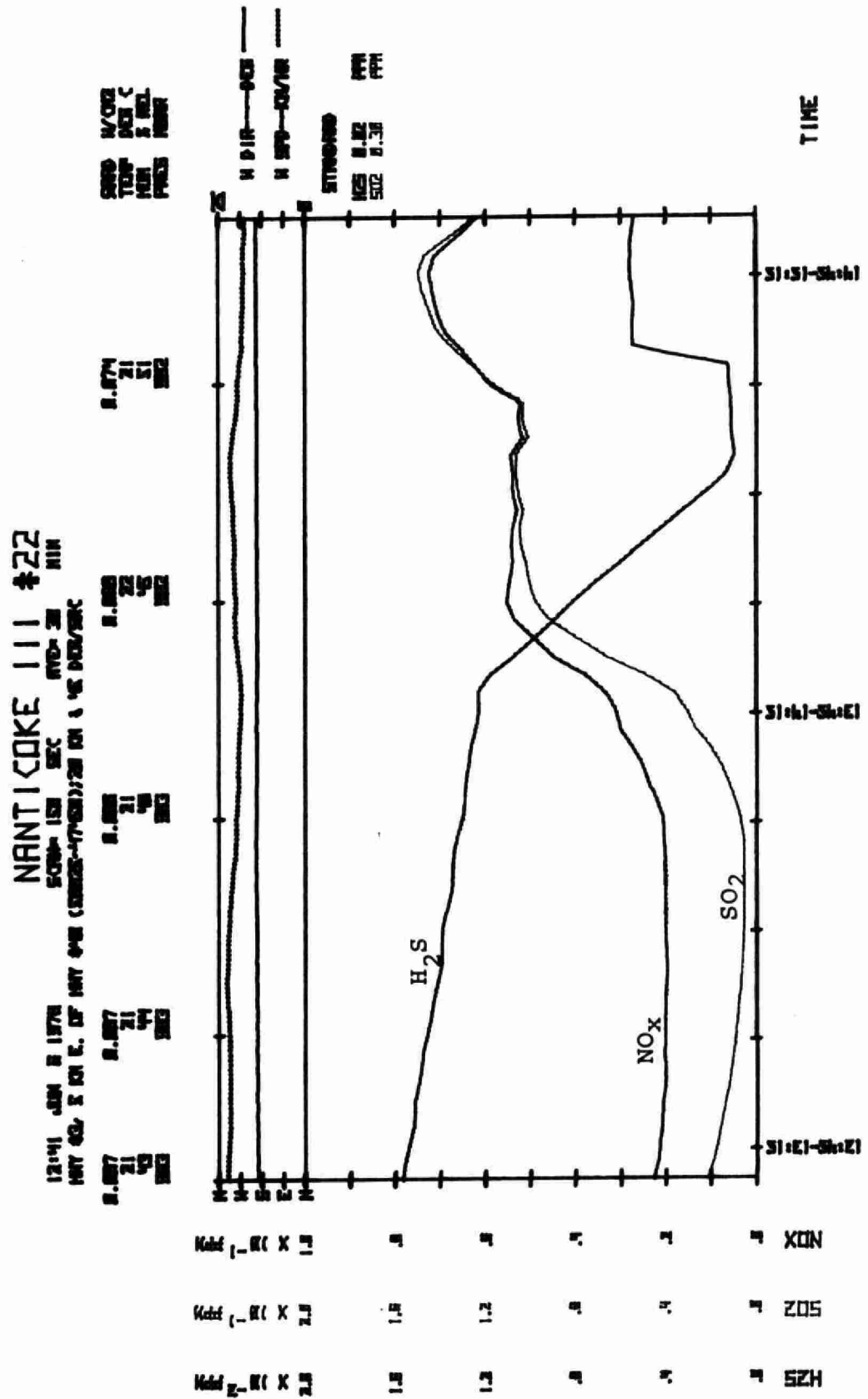




FIGURE #9

# NANTICKE 111 #25

11:53 JUN 12 1978

5000-50 SEC

MIN

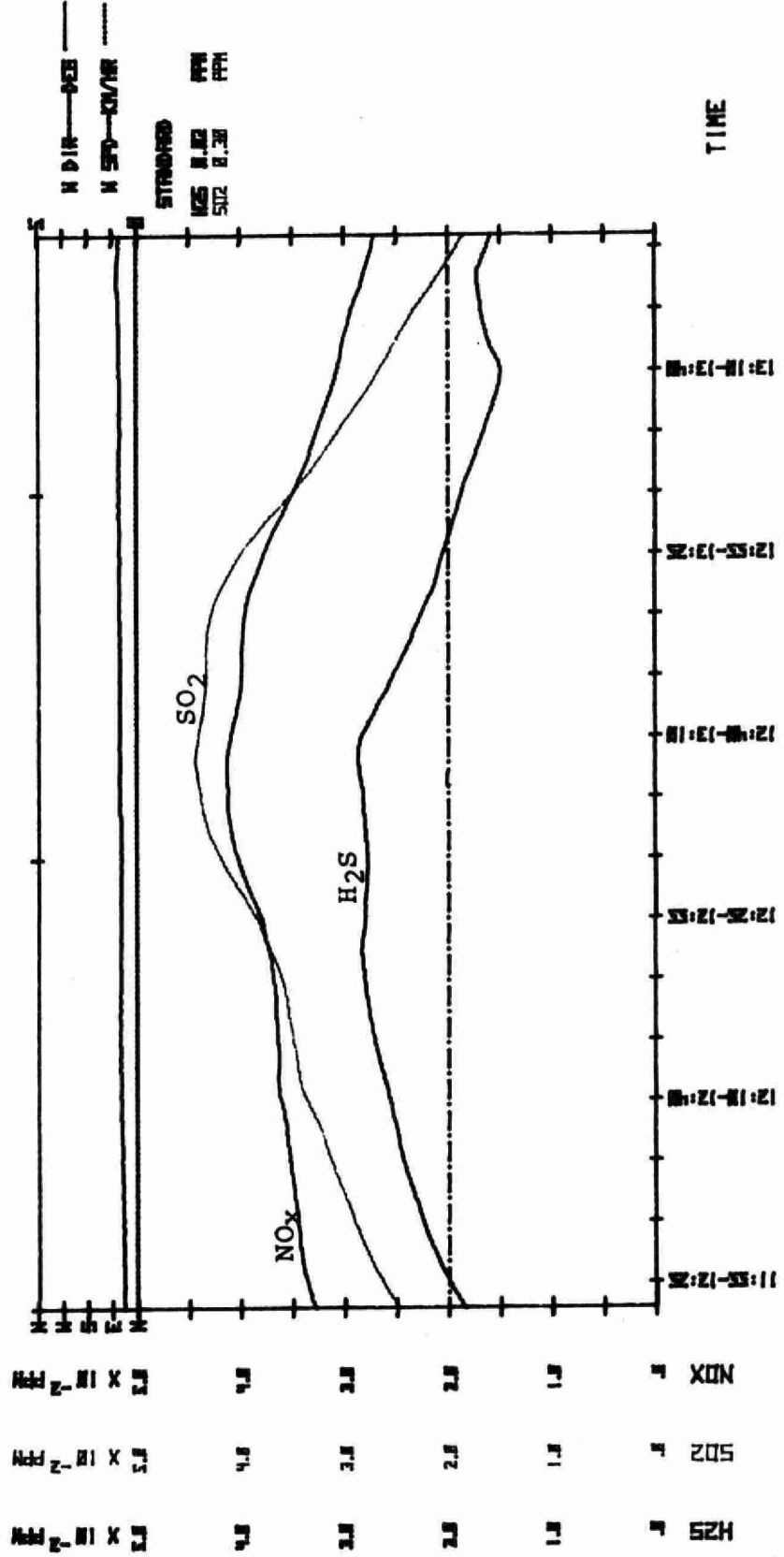
MAY 0504 5 PM N OF MAY 03 (SUNSET-0515) 31 CM 1 W 050/SEC

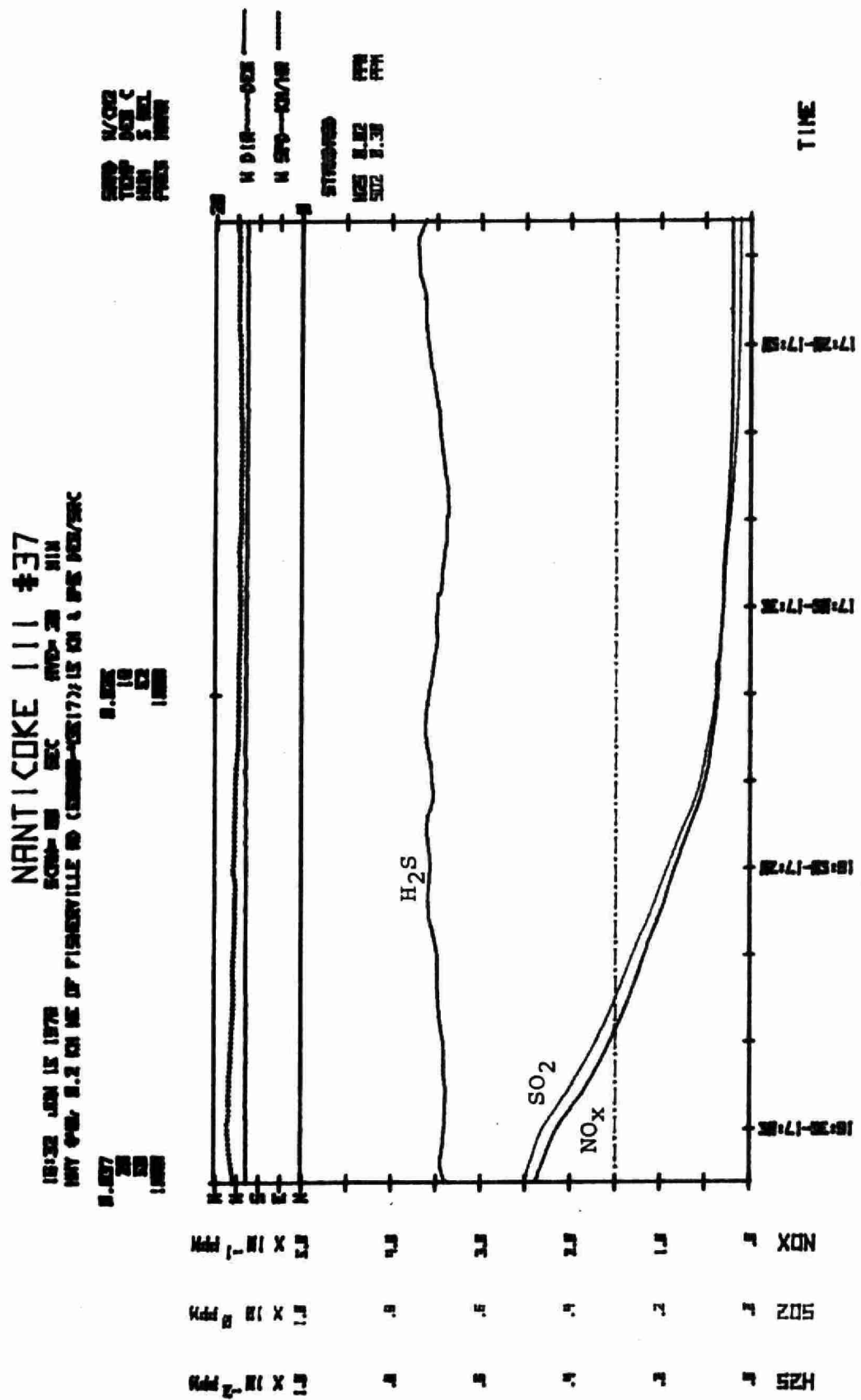
WIND  
DIR  
SPEED

WIND  
DIR  
SPEED

WIND  
DIR  
SPEED

WIND  
DIR  
SPEED







*Environment Ontario*  
Laboratory Library  
125 Resources Rd.  
**Etobicoke, Ontario M9P 3V6**  
**Canada**

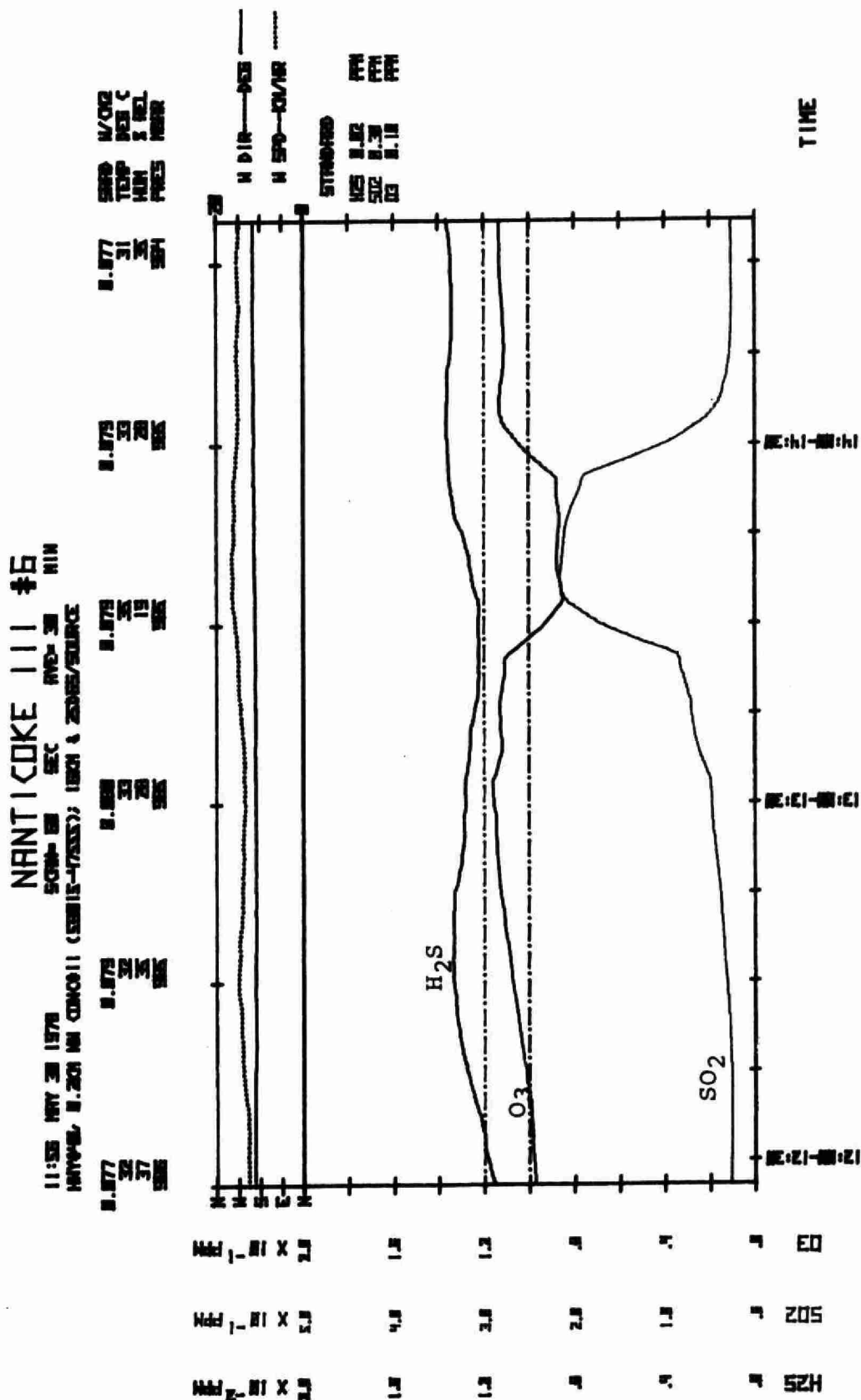


FIGURE #12

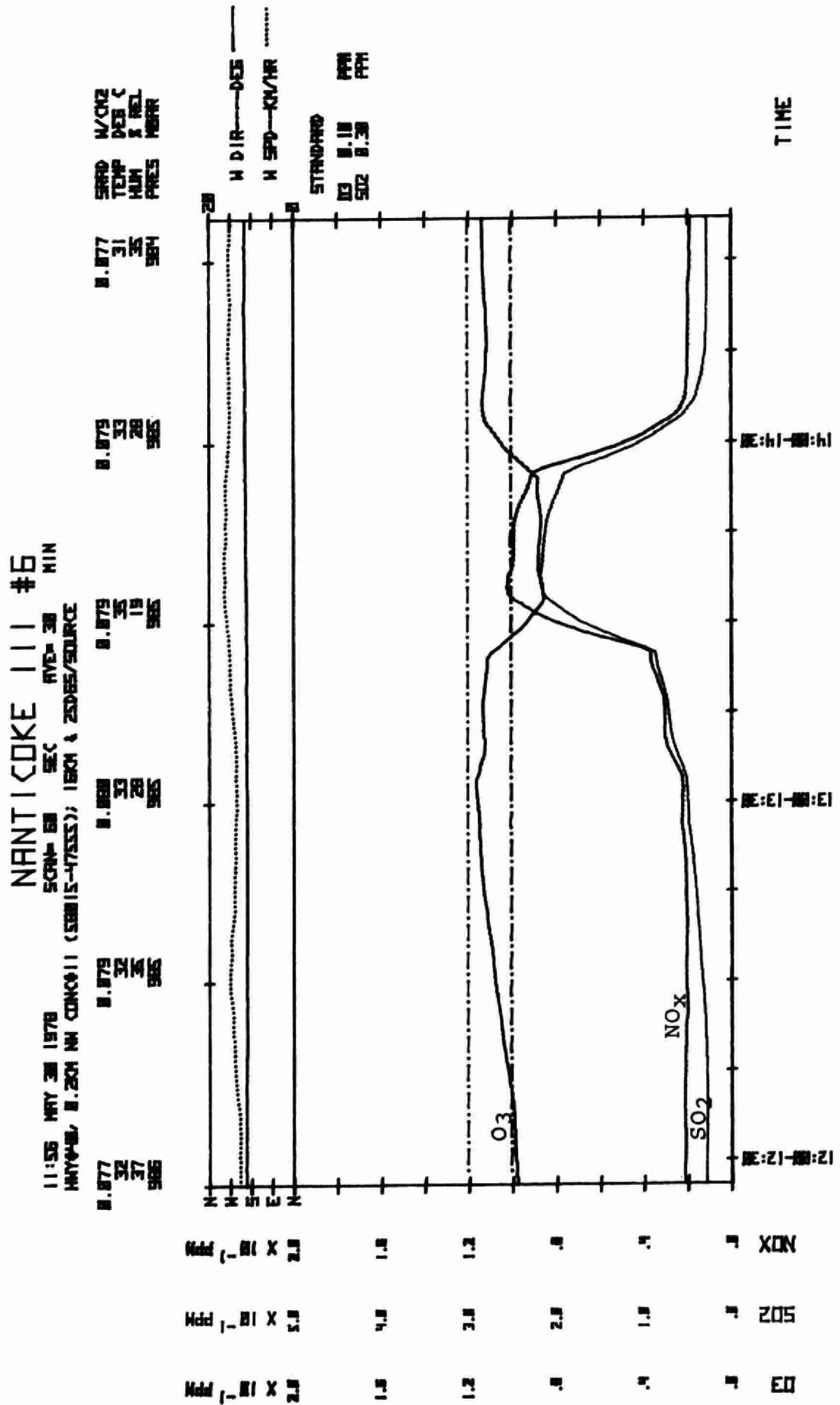


FIGURE #13

NANTICOKE III #7  
 15:47 MAY 30 1978  
 5000-20 SEC RWS-20 MIN  
 NANTICOKE & BELKINC RD. (SEP78-17515); 12.50N & 3000E/SOURCE

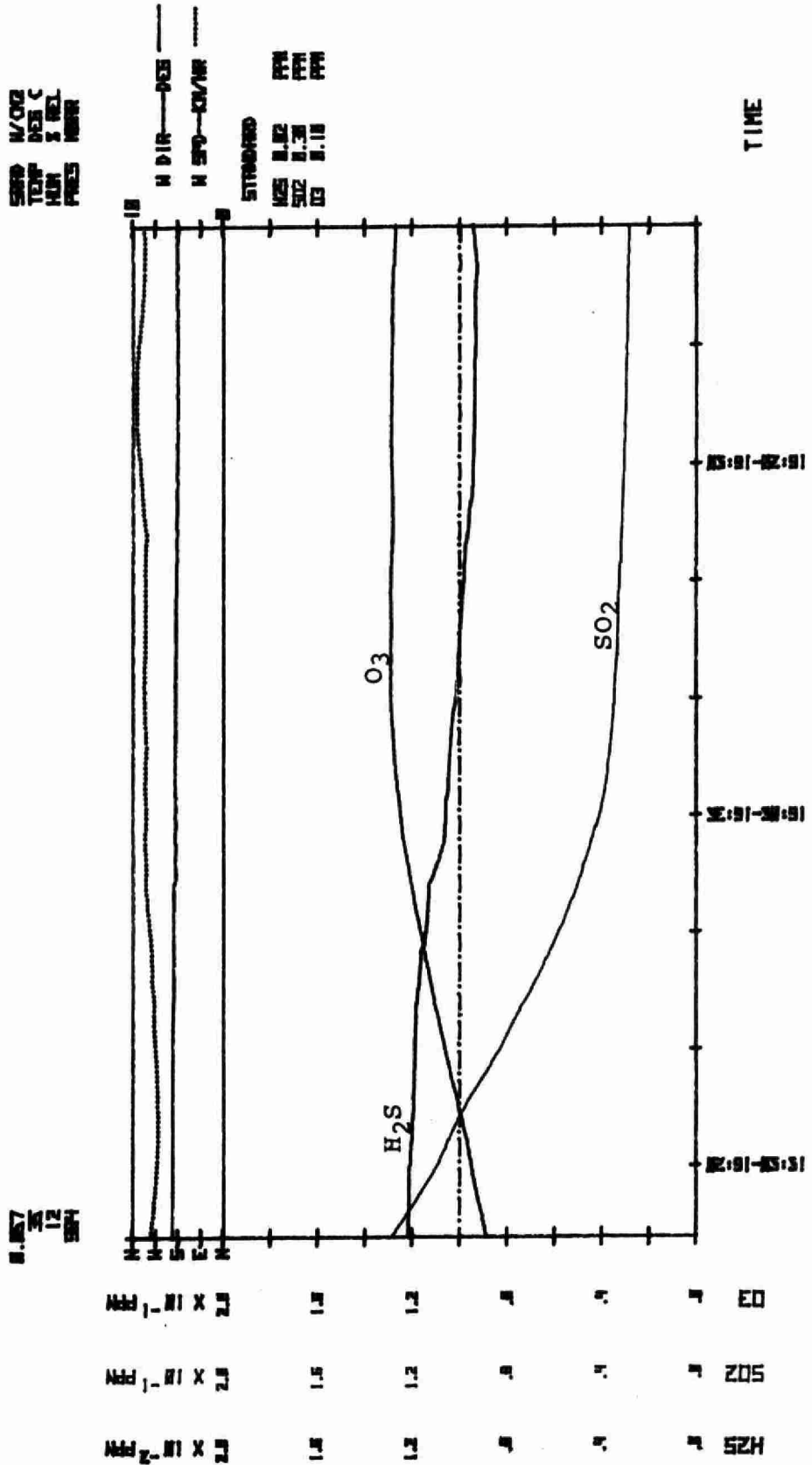


FIGURE #14

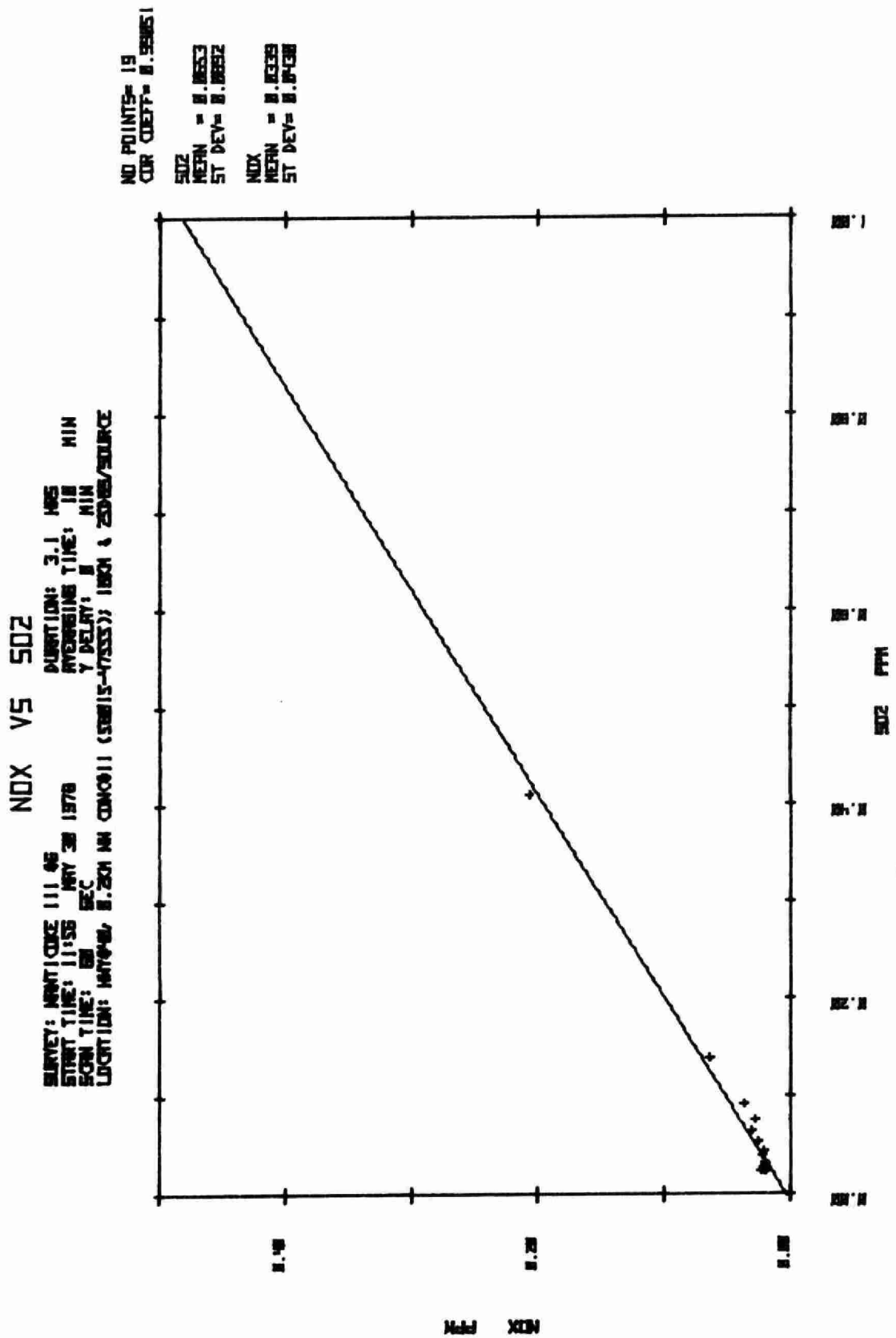




FIGURE #15

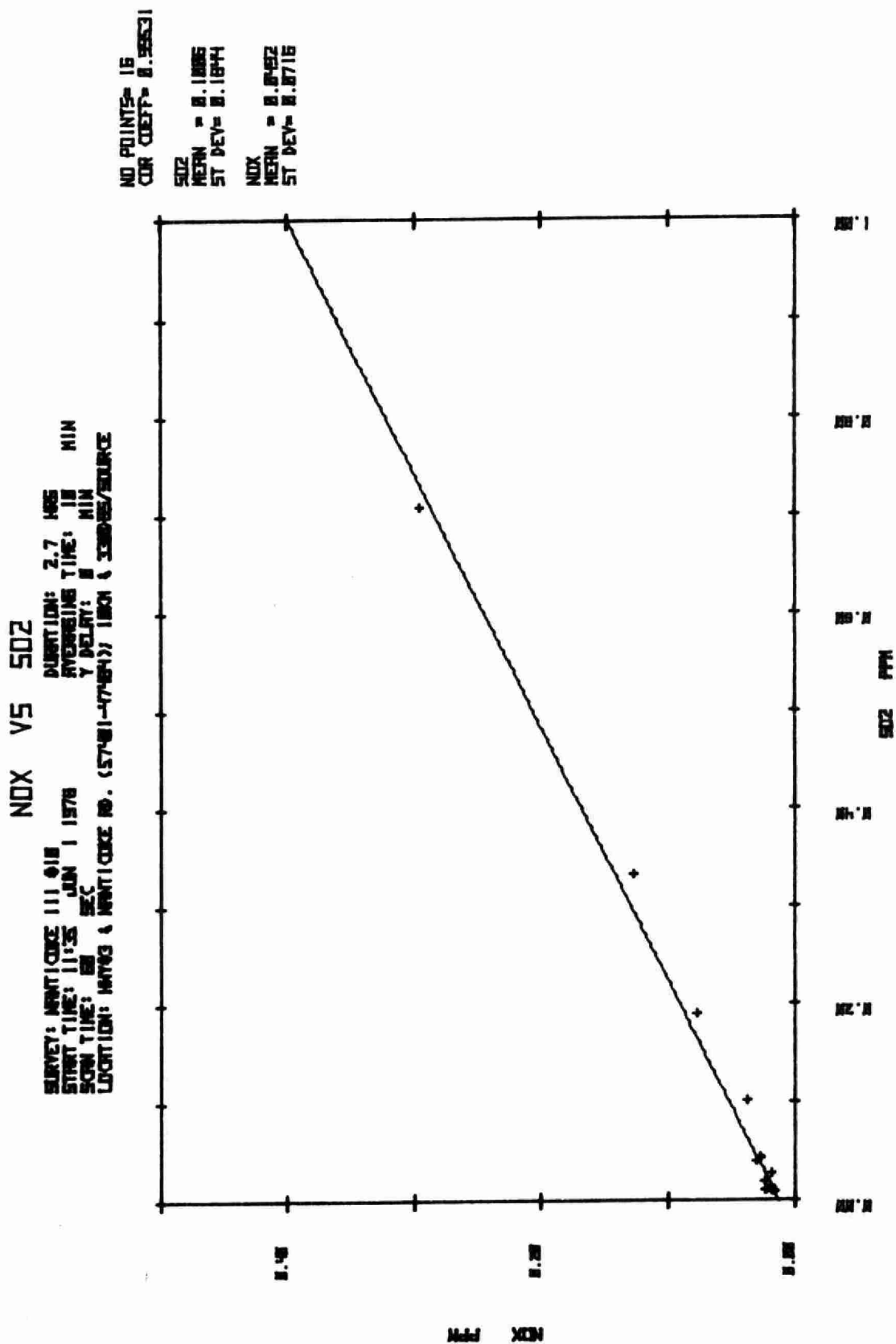


FIGURE #16

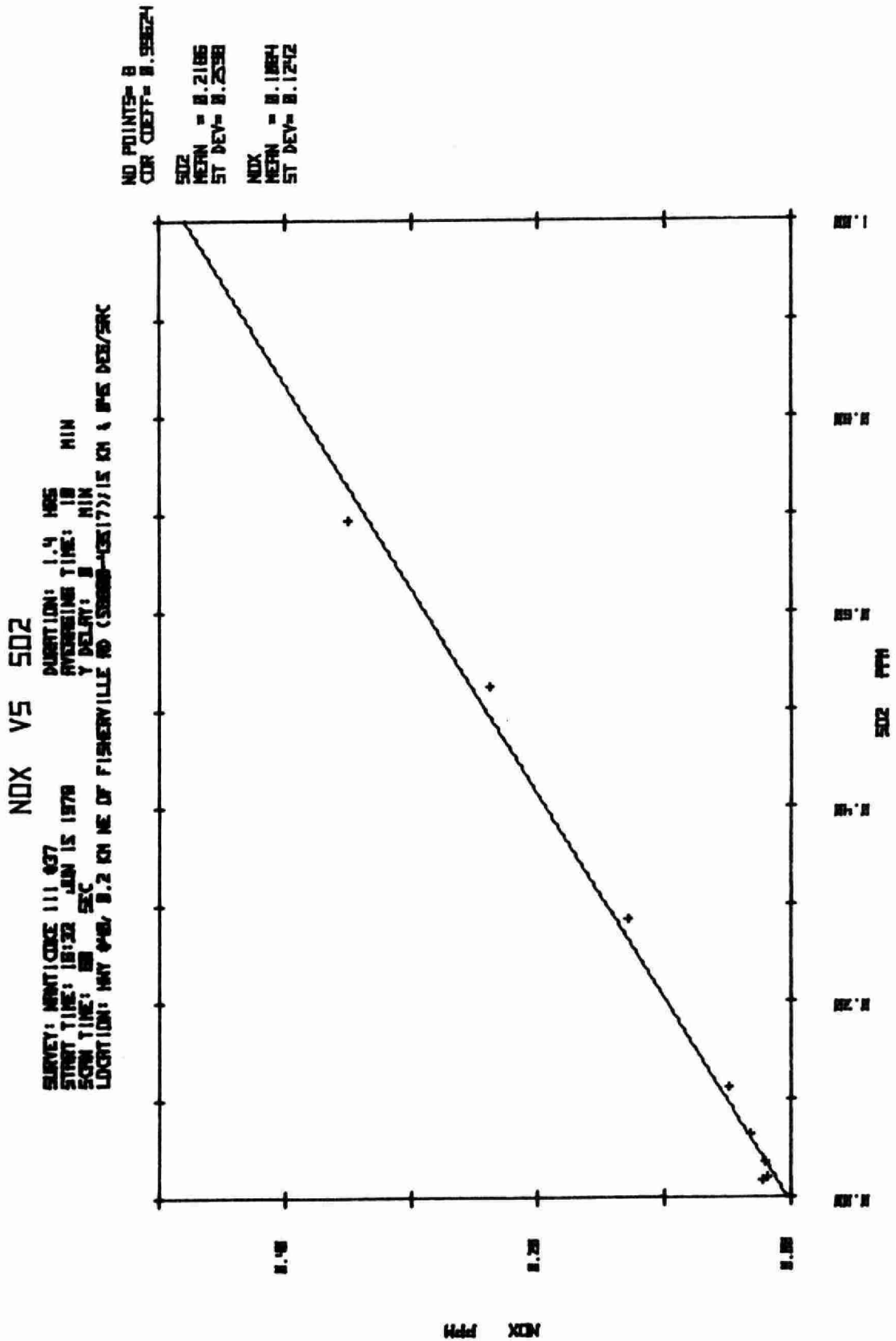


FIGURE #17

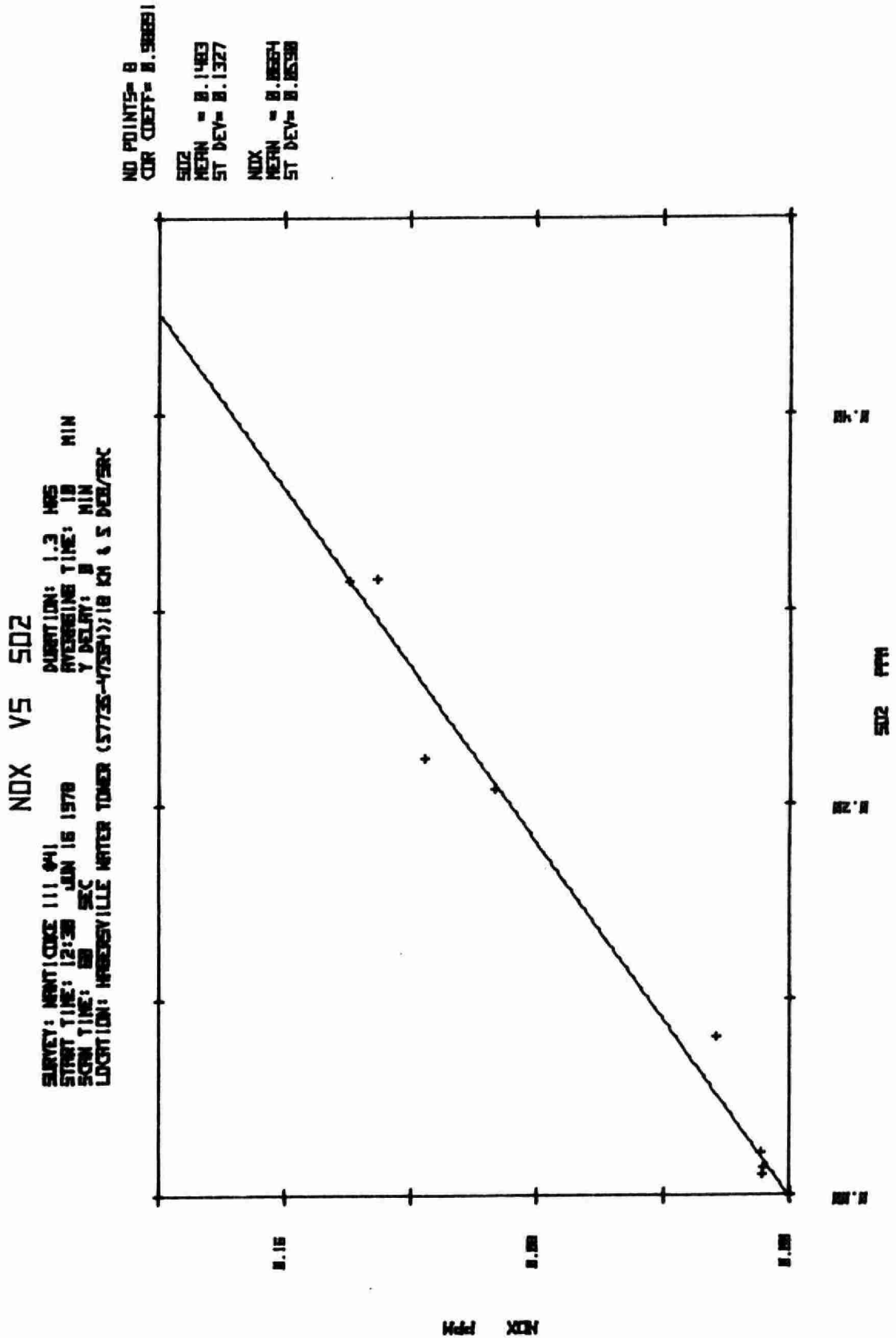


FIGURE #18

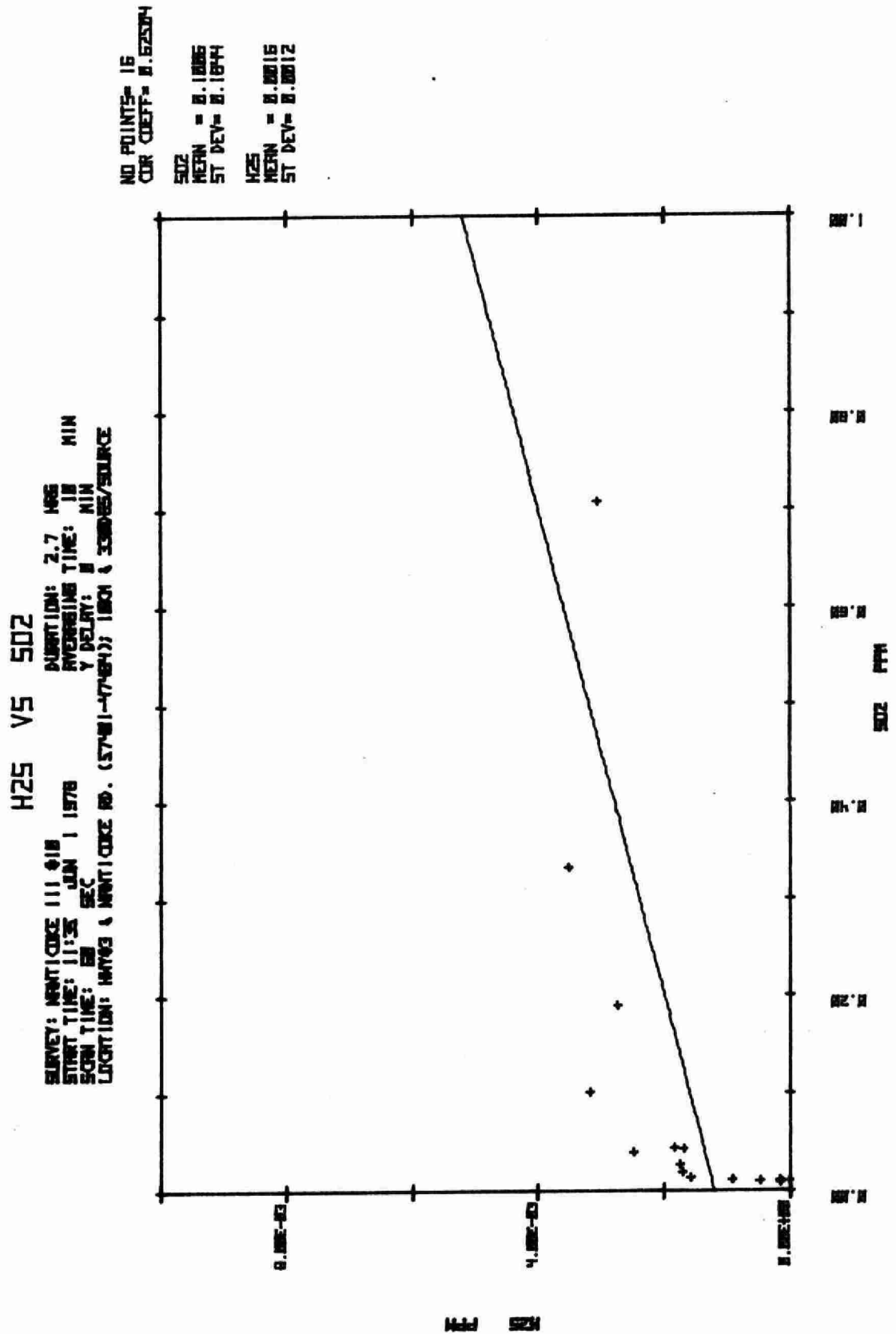


FIGURE #19

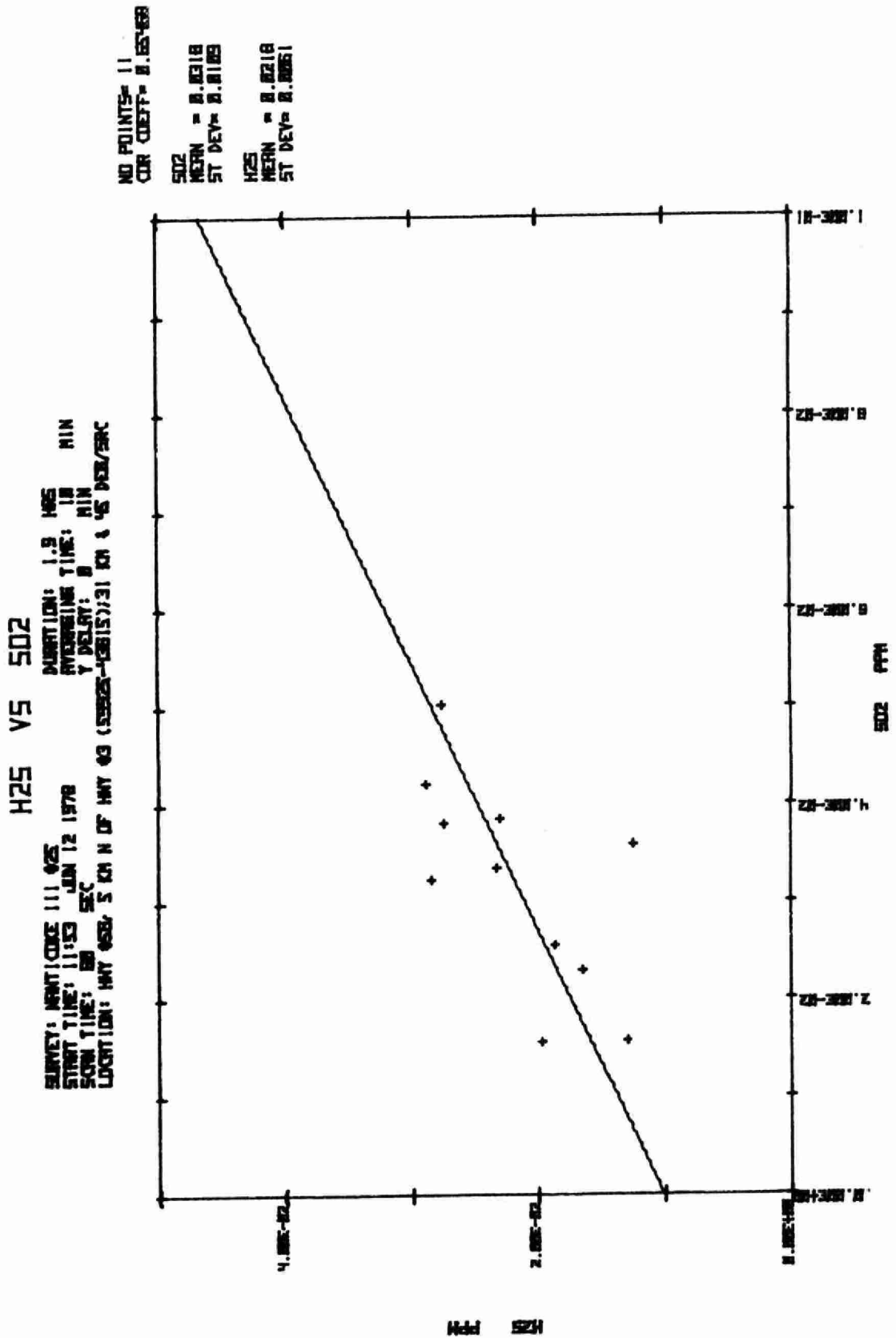


FIGURE #20

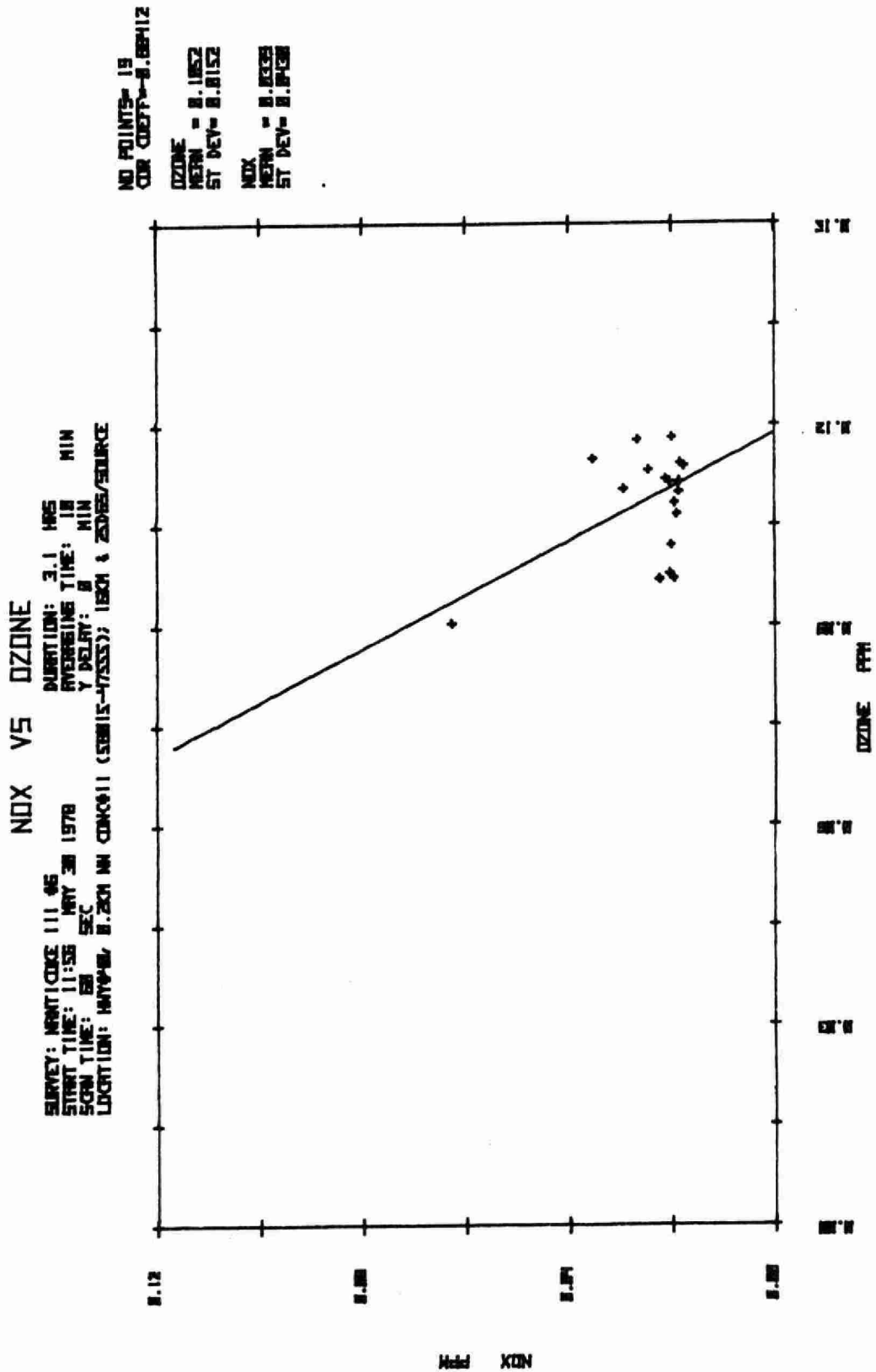


FIGURE #21

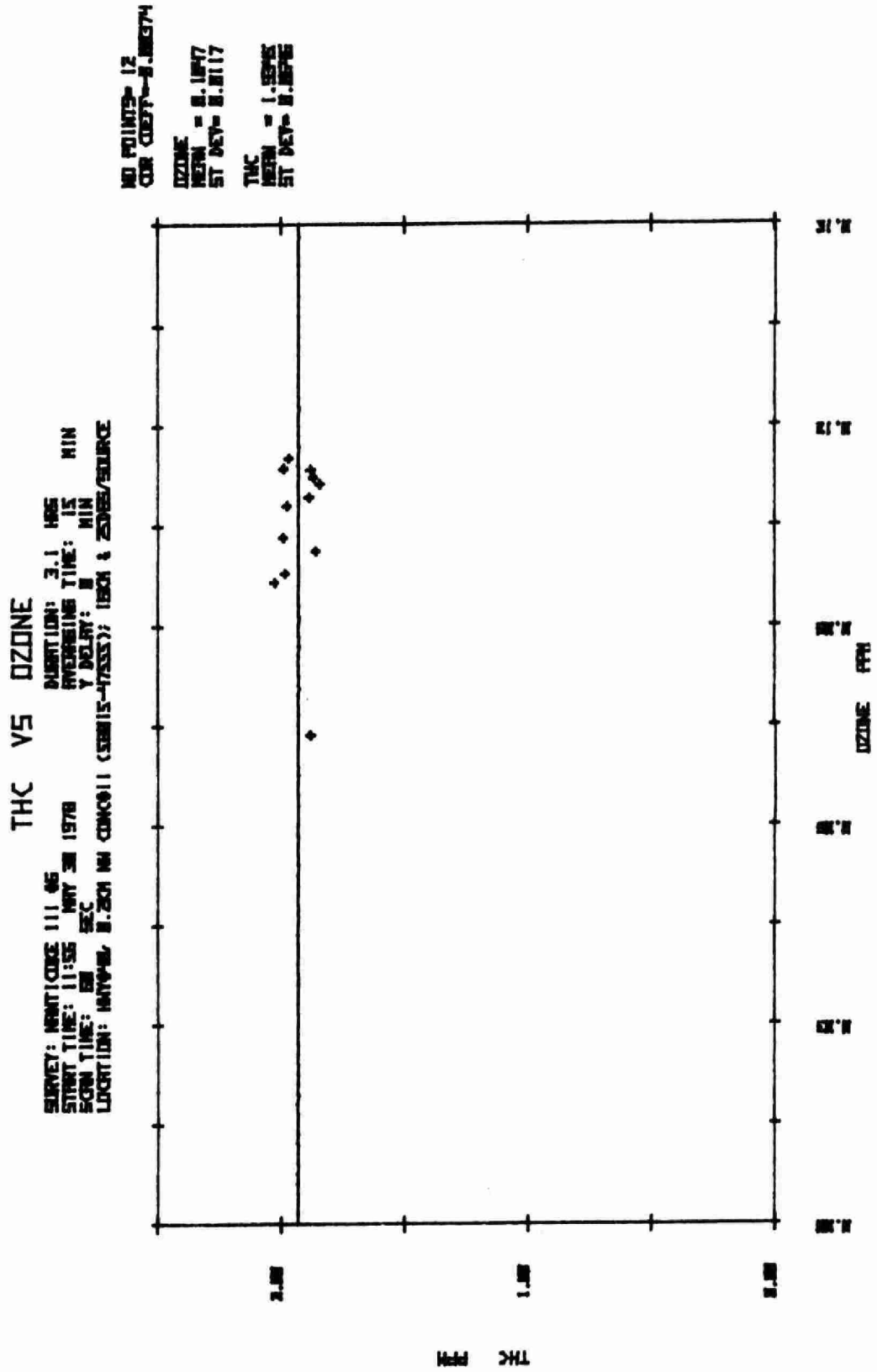


FIGURE #22

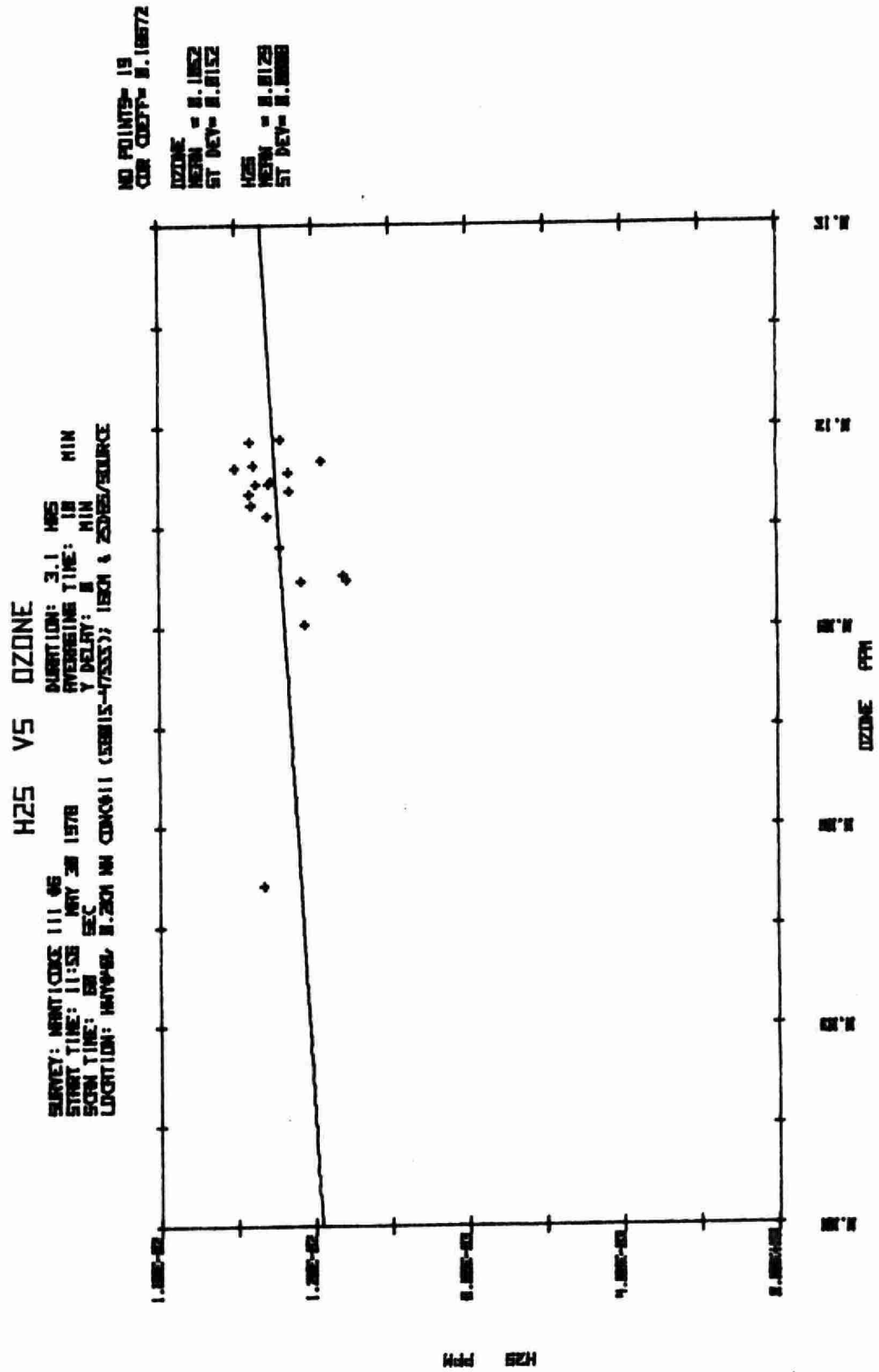
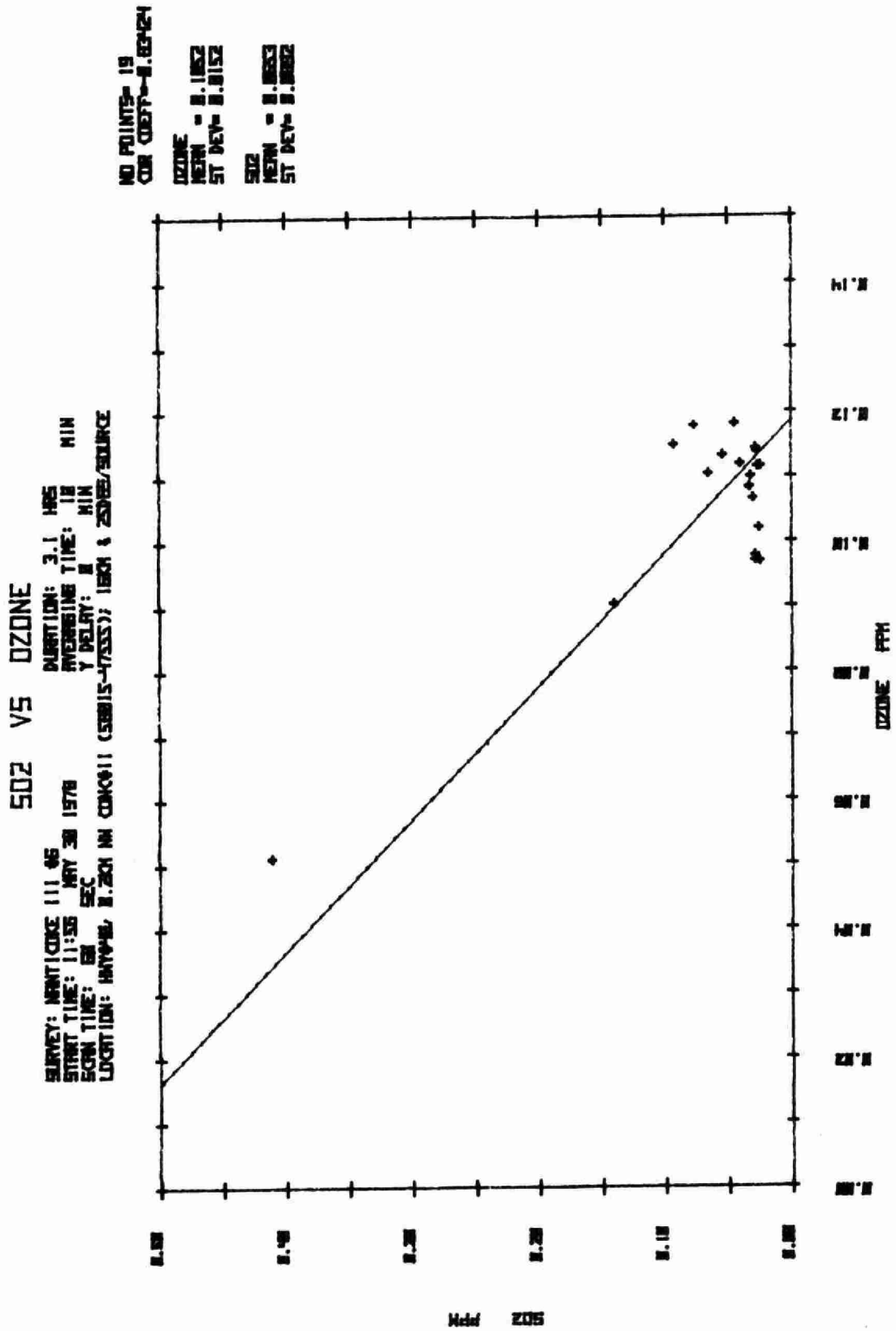




FIGURE #23



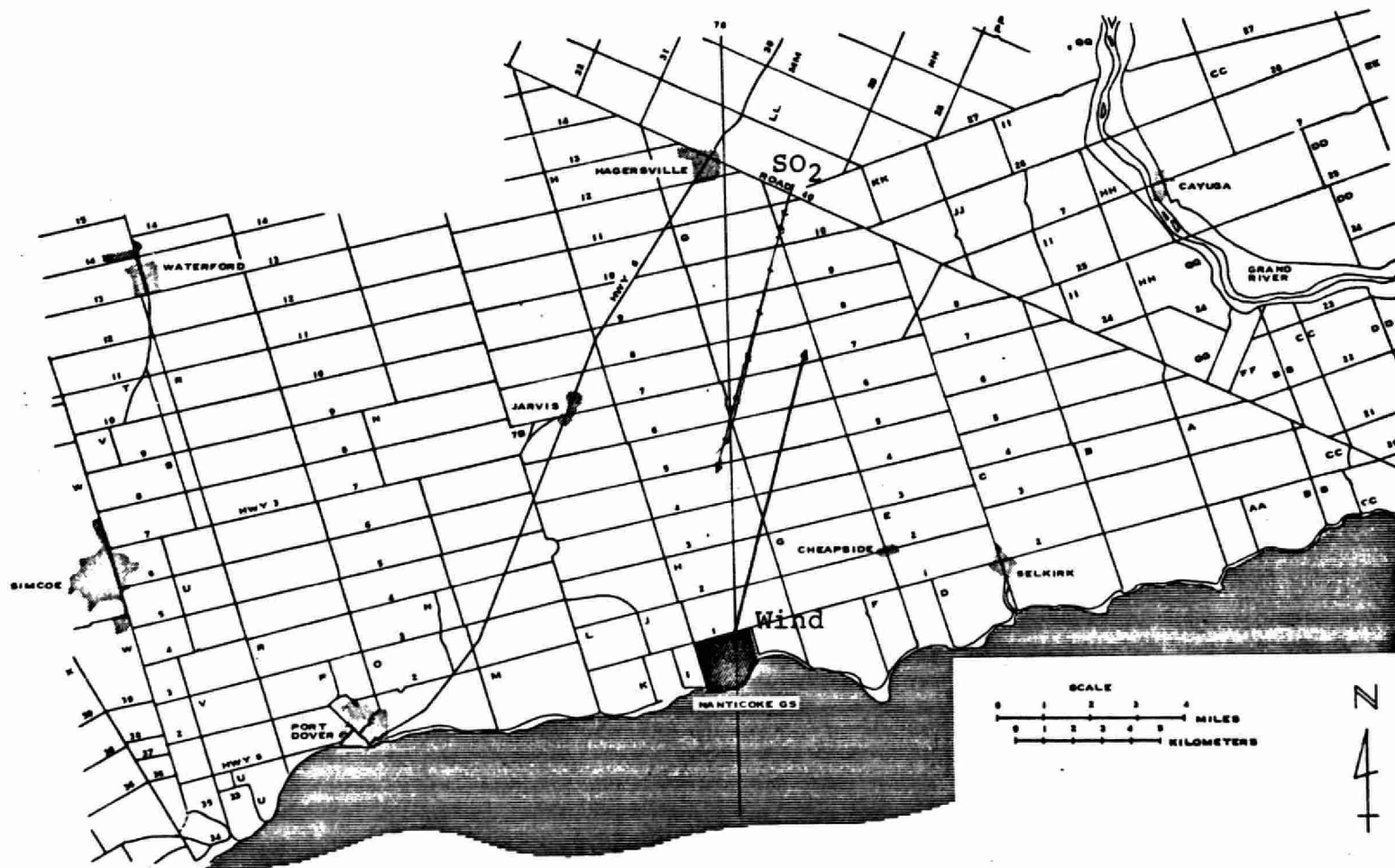
# NANTICKE III #6

11:56 MAY 30 1978  
 LENGTH= 3.1 HRS  
 DELAY= 0 MIN  
 LOC: HWY 40, 0.2KM NW CONCO 11

SCAN= 60 SEC AVE= 30 MIN  
 MINIMUM MEAN= 1.00000E-03 PPM  
 WIND RANGE= 0 / 20 KM/HR  
 (50015-47555); 15KM & 25005/SOURCE

ARITHMETIC MEAN: SO2  
 1 DIV= 0.01 PPM

PREVAILING WINDS; BLOWING TOWARDS:  
 1 DIV= 100 %



MAP #3

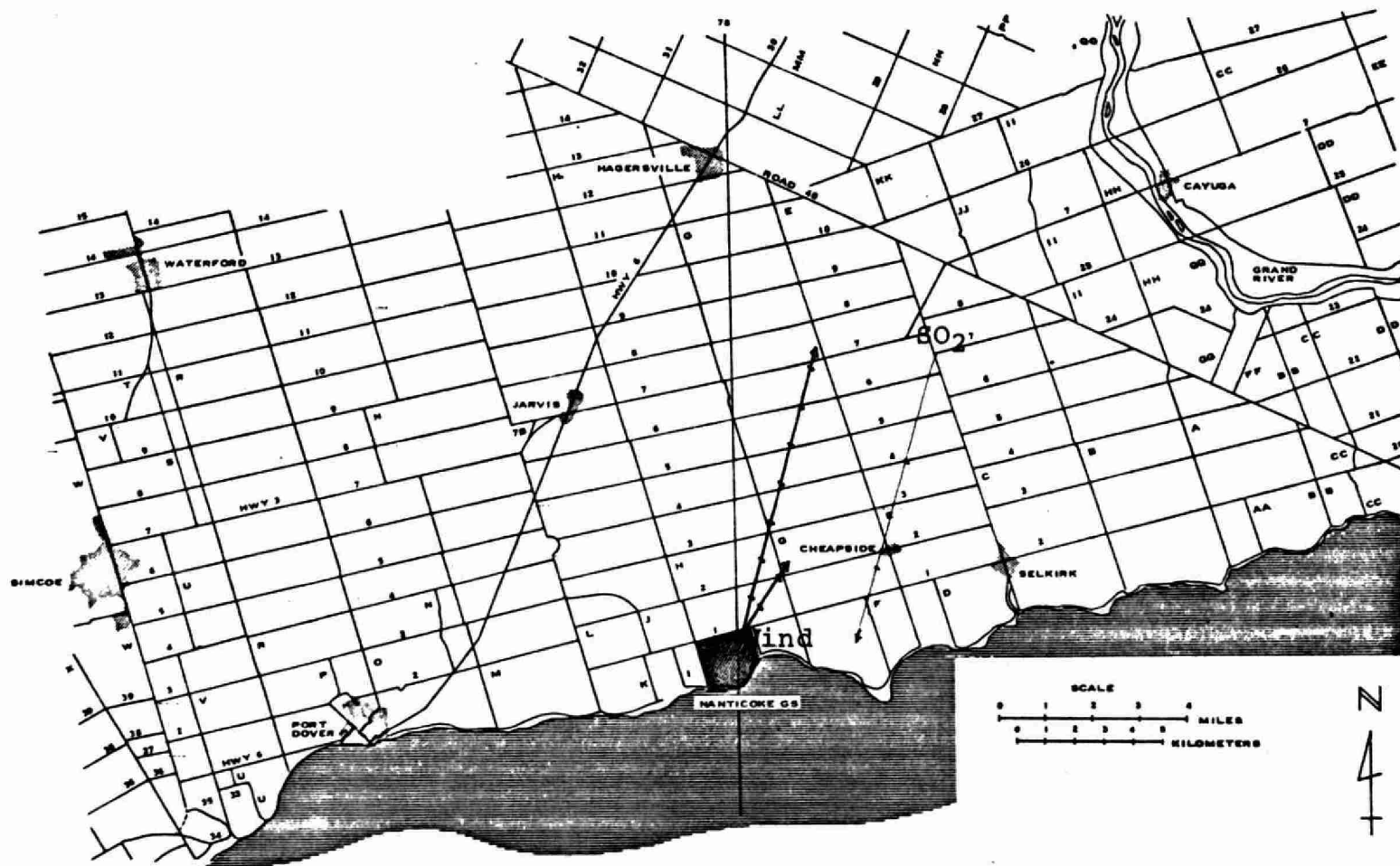
# NANTICKE III #23

15:57 JUN 6 1978  
 LENGTH= 2.2 HRS  
 DELAY= 8 MIN  
 LOC: SELKIRK RD, .2KM N WALPOLE CON 46 (SBS18-47581); 14 KM & 50 DGB/SEC

SCAN= 60 SEC AVE= 30 MIN  
 MINIMUM MEAN= 1.00000E-03 PPM  
 WIND RANGE= 0 , 20 KM/HR

ARITHMETIC MEAN: 502  
 1 DIV= 0.1 PPM

PREVAILING WINDS; BLOWING TOWARDS:  
 1 DIV= 10 %



MAP #4

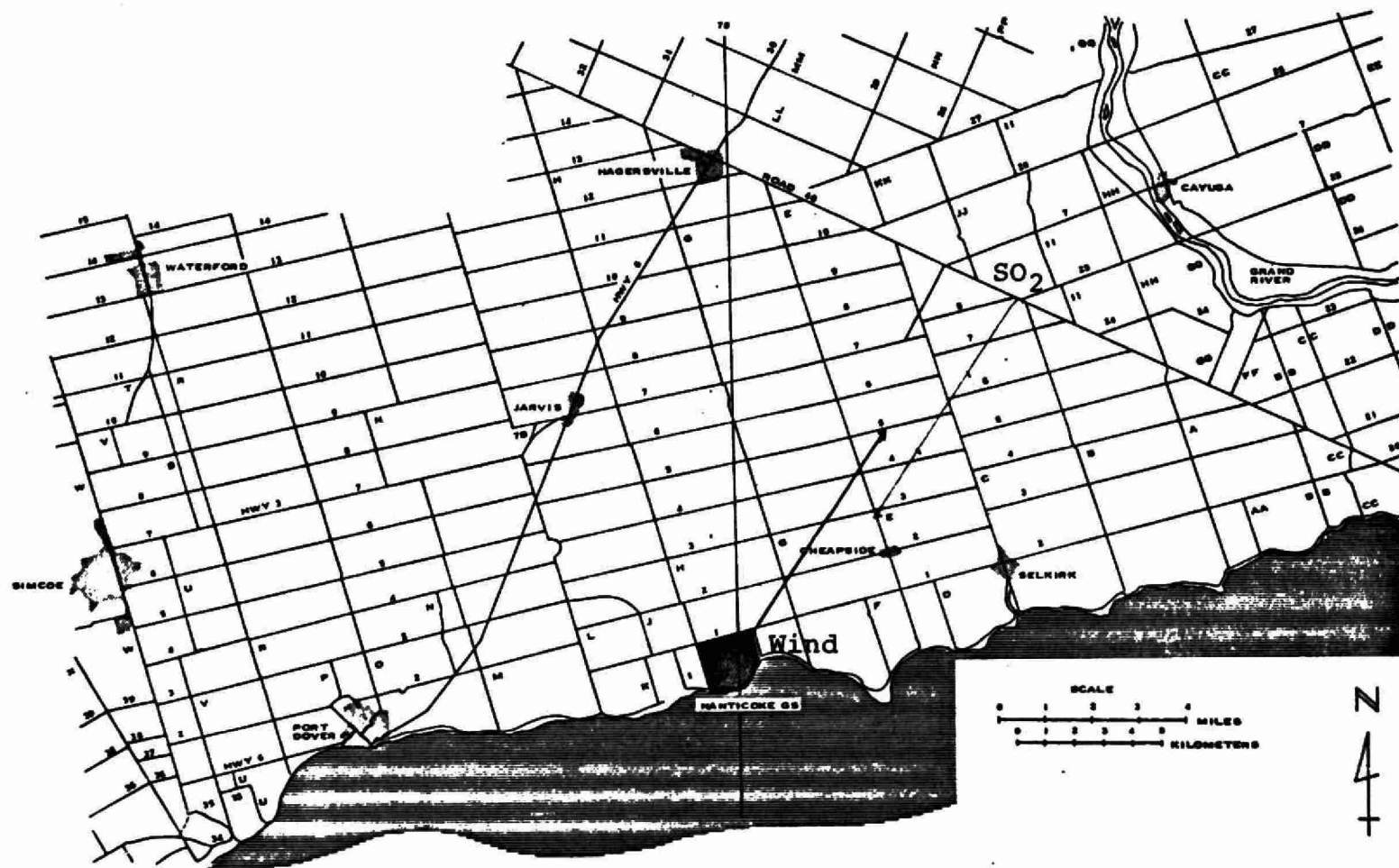
# NANTICKE 111 #37

16:32 JUN 15 1978  
 LENGTH= 1.4 HRS  
 DELAY= 8 MIN  
 LOC: HWY 640, 0.2 KM NE OF FISHERVILLE RD (S0000-40517) 1.5 KM & 84K DEL/SEC

SCAN= 00 SEC AVE= 30 MIN  
 MINIMUM MEAN= 1.00000E-03 PPM  
 WIND RANGE= 0 / 20 KM/HR

ARITHMETIC MEAN: 502  
 1 DIV= 0.1 PPM

PREVAILING WINDS: BLOWING TOWARDS:  
 1 DIV= 100 %



MAP #5

# NANTICKE 111 #41

12:30 JUN 16 1978  
 LENGTH= 1.3 HRS  
 DELAY= 8 MIN  
 LOC: HAGERVILLE WATER TOWER (E772K-47534); 18 KM & S DEB/SEC

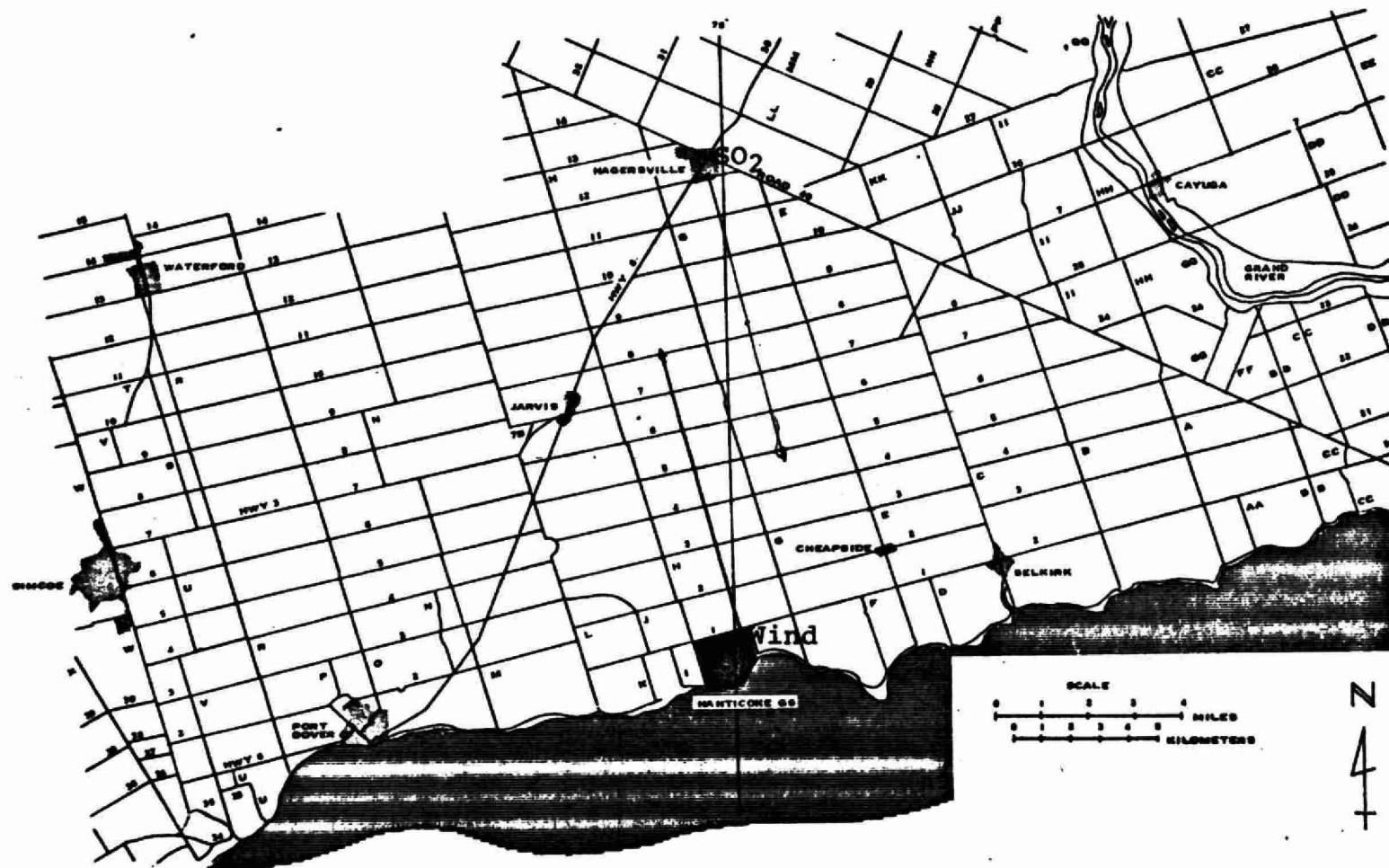
SCN= 88 SEC RVD= 28 MIN  
 MINIMUM MEAN= 1.0000E-03 PPM  
 WIND SPEED= 8 , 28 KM/HR

ARITHMETIC MEAN: 502

1 DIV= 0.1 PPM

PREVAILING WINDS: BLOWING TOWARDS:

1 DIV= 100 %



MAP #6

TABLE # 5a

## Contaminant Levels in Nanticoke

Units - ppm

LOCATION	Date May '78	Monitored Period	Instantaneous Concentration				Maximum 1/2 Hour Average Concentration		Sample Period Mean Concentration		Scan Time  (min.)
			SO <sub>2</sub>		H <sub>2</sub> S		SO <sub>2</sub>	H <sub>2</sub> S	SO <sub>2</sub>	H <sub>2</sub> S	
			Min.	Max.	Min.	Max.					
Nanticoke III #2	29	09:18 - 15:18	0.010	0.087	0.001	0.060	0.072	0.018	0.036	0.003	2.5
" " #3	29	15:42 - 17:09	0.012	0.380	0.001	0.013	0.210	0.012	0.083	0.008	1.5
" " #4	29	17:49 - 18:28	0.013	0.093	0.002	0.004	0.027	0.003	0.024	0.003	1.5
" " #6	30	11:56 - 15:07	0.023	0.710	0.010	0.015	0.220	0.014	0.065	0.013	1.0
" " #7	30	15:47 - 17:00	0.025	0.233	0.001	0.014	0.130	0.012	0.070	0.011	1.0
" " #8	31	09:06 - 11:25	0.006	0.014	0.001	0.035	0.013	0.016	0.011	0.013	1.0
" " #9	June 1	09:30 - 11:14	0.006	0.021	0.001	0.044	0.013	0.025	0.011	0.012	1.0
" " #10	1	11:35 - 14:20	0.008	0.978	0.001	0.005	0.410	0.003	0.098	0.002	1.0
" " #11	1	15:43 - 16:47	0.017	0.432	0.001	0.003	0.220	0.002	0.154	0.001	1.0
" " #12	2	10:59 - 15:20	0.003	0.026	0.001	0.008	0.021	0.004	0.011	0.002	1.0
" " #14	3	08:46 - 10:01	0.001	0.012	0.001	0.023	0.002	0.004	0.002	0.002	1.0
" " #15	3	22:25 - 06:52	0.001	0.015	0.001	0.042	0.005	0.021	0.001	0.002	1.0
" " #16	4	08:07 - 09:46	0.004	0.008	0.001	0.025	0.006	0.020	0.005	0.016	1.0
" " #17	4	10:48 - 12:30	0.015	0.074	0.006	0.016	0.043	0.014	0.026	0.013	1.0
" " #18	4	12:44 - 13:47	0.015	0.024	0.001	0.012	0.022	0.009	0.019	0.008	1.0
" " #19	4	14:15 - 14:56	0.021	0.101	0.001	0.008	0.056	0.006	0.048	0.005	1.0

TABLE # 5b

## Contaminant Levels in Nanticoke

Units - ppm

LOCATION	Date June '78	Monitored Period	Instantaneous Concentration				Maximum 1/2 Hour Average Concentration		Sample Period Mean Concentration		Scan Time  (min.)
			SO <sub>2</sub>		H <sub>2</sub> S		SO <sub>2</sub>	H <sub>2</sub> S	SO <sub>2</sub>	H <sub>2</sub> S	
			Min.	Max.	Min.	Max.					
Nanticoke III #20	5	11:35 - 15:10	0.001	0.003	0.002	0.013	0.001	0.010	0.001	0.007	2.5
" " #21	6	11:23 - 12:33	0.032	0.242	0.016	0.026	0.140	0.024	0.088	0.022	2.5
" " #22	6	12:41 - 15:21	0.003	0.259	0.001	0.051	0.150	0.016	0.059	0.010	2.5
" " #23	6	15:57 - 18:13	0.032	0.990	0.001	0.013	0.400	0.012	0.262	0.008	1.0
" " #24	12	09:53 - 11:15	0.011	0.013	0.001	0.030	0.012	0.014	0.012	0.012	1.0
" " #25	12	11:53 - 13:51	0.013	0.054	0.001	0.032	0.044	0.029	0.031	0.021	1.0
" " #26	12	14:41 - 15:49	0.015	0.107	0.001	0.011	0.069	0.004	0.044	0.003	1.0
" " #27	13	09:21 - 10:07	0.003	0.005	0.010	0.014	0.004	0.012	0.004	0.012	1.0
" " #30	13	12:47 - 13:52	0.001	0.003	0.001	0.002	0.003	0.002	0.002	0.002	2.5
" " #32	14	09:05 - 13:55	0.001	0.003	0.001	0.026	0.023	0.011	0.001	0.007	2.5
" " #36	15	15:04 - 16:28	0.005	0.154	0.001	0.010	0.023	0.008	0.016	0.005	1.0
" " #37	15	16:32 - 17:57	0.014	0.882	0.003	0.010	0.500	0.007	0.207	0.007	1.0
" " #38	15	18:36 - 19:14	0.011	0.054	0.001	0.004	0.041	0.002	0.035	0.002	1.0
" " #39	16	08:27 - 10:46	0.005	0.008	0.001	0.014	0.007	0.012	0.007	0.010	1.0
" " #40	16	11:10 - 12:05	0.004	0.005	0.001	0.008	0.005	0.005	0.004	0.005	1.0
" " #41	16	12:30 - 13:51	0.008	0.407	0.001	0.015	0.280	0.013	0.147	0.013	1.0







TABLE # 6a

## Contaminant Levels in Nanticoke

Units - ppm

LOCATION	Date May '78	Monitored Period	Instantaneous Concentration				Maximum 1/2 Hour Average Concentration		Sample Period Mean Concentration		Scan Time
			O <sub>3</sub>		NO <sub>x</sub>		O <sub>3</sub>	NO <sub>x</sub>	O <sub>3</sub>	NO <sub>x</sub>	(min.)
			Min.	Max.	Min.	Max.					
Nanticoke III #2	29	09:18 - 15:18	0.025	0.067	0.010	0.043	0.065	0.034	0.046	0.023	2.5
" " #3	29	15:42 - 17:09	0.011	0.082	0.016	0.167	0.077	0.096	0.062	0.045	1.5
" " #4	29	17:49 - 18:28	0.063	0.081	0.014	0.043	0.078	0.020	0.076	0.019	1.5
" " #6	30	11:56 - 15:07	0.007	0.126	0.017	0.380	0.120	0.100	0.105	0.034	1.0
" " #7	30	15:47 - 17:00	0.051	0.144	0.018	0.124	0.130	0.064	0.112	0.040	1.0
" " #8	31	09:06 - 11:25	0.036	0.076	0.018	0.070	0.070	0.028	0.058	0.025	1.0
" " #9	June 1	09:30 - 11:14	0.013	0.042	0.012	0.243	0.039	0.062	0.032	0.037	1.0
" " #10	1	11:35 - 14:20	0.002	0.053	0.012	0.405	0.050	0.170	0.040	0.048	1.0
" " #11	1	15:43 - 16:47	0.012	0.079	0.011	0.145	0.066	0.070	0.051	0.050	1.0
" " #12	2	10:59 - 15:20	0.020	0.064	0.014	0.292	0.058	0.140	0.045	0.067	1.0
" " #14	3	08:46 - 10:01	0.001	0.030	0.001	0.179	0.026	0.058	0.025	0.036	1.0
" " #15	3	22:25 - 06:52	0.001	0.015	0.022	0.172	0.009	0.086	0.004	0.044	1.0
" " #16	4	08:07 - 09:46	0.024	0.043	0.005	0.045	0.041	0.013	0.035	0.010	1.0
" " #17	4	10:48 - 12:30	0.033	0.055	0.006	0.079	0.051	0.021	0.046	0.015	1.0
" " #18	4	12:44 - 13:47	0.051	0.071	0.007	0.038	0.064	0.011	0.060	0.010	1.0
" " #19	4	14:15 - 14:56	0.045	0.067	0.006	0.046	0.062	0.020	0.060	0.018	1.0

TABLE # 6b

## Contaminant Levels in Nanticoke

Units - ppm

LOCATION	Date June '78	Monitored Period	Instantaneous Concentration				Maximum 1/2 Hour Average Concentration		Sample Period Mean Concentration		Scan Time  (min.)
			O <sub>3</sub>		NO <sub>x</sub>		O <sub>3</sub>	NO <sub>x</sub>	O <sub>3</sub>	NO <sub>x</sub>	
			Min.	Max.	Min.	Max.					
Nanticoke III #20	5	11:35 - 15:10	0.035	0.043	0.010	0.182	0.042	0.034	0.040	0.024	2.5
" " #21	6	11:23 - 12:33	0.010	0.034	0.023	0.118	0.031	0.071	0.025	0.049	2.5
" " #22	6	12:41 - 15:21	0.019	0.054	0.018	0.129	0.049	0.072	0.040	0.039	2.5
" " #23	6	15:57 - 18:13	0.003	0.047	0.012	0.281	0.034	0.150	0.020	0.100	1.0
" " #24	12	09:53 - 11:15	0.048	0.065	0.017	0.030	0.062	0.021	0.058	0.020	1.0
" " #25	12	11:53 - 13:51	0.065	0.080	0.024	0.047	0.077	0.041	0.072	0.034	1.0
" " #26	12	14:41 - 15:49	0.052	0.079	0.033	0.084	0.072	0.059	0.070	0.046	1.0
" " #27	13	09:21 - 10:07	0.013	0.017	0.012	0.086	0.016	0.041	0.016	0.034	1.0
" " #30	13	12:47 - 13:52	0.023	0.027	0.016	0.050	0.025	0.025	0.025	0.023	2.5
" " #32	14	09:05 - 13:55	0.030	0.043	0.005	0.100	0.041	0.035	0.038	0.021	2.5
" " #36	15	15:04 - 16:28	0.014	0.050	0.010	0.082	0.047	0.025	0.045	0.021	1.0
" " #37	15	16:32 - 17:57	0.003	0.049	0.015	0.480	0.047	0.240	0.030	0.104	1.0
" " #38	15	18:36 - 19:14	0.036	0.047	0.012	0.073	0.042	0.033	0.041	0.031	1.0
" " #39	16	08:27 - 10:46	0.009	0.043	0.009	0.177	0.038	0.044	0.034	0.032	1.0
" " #40	16	11:10 - 12:05	0.043	0.053	0.009	0.024	0.050	0.017	0.049	0.016	1.0
" " #41	16	12:30 - 13:51	0.008	0.060	0.008	0.172	0.058	0.120	0.036	0.066	1.0





(6991)

TD/883.7/N3 A42/MOE

TD/883.7/N3 A42/MOE  
Ontario Ministry of the En  
Ambient air survey  
in the Nanticoke almv  
c.1 a aa